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JUNE, 1962

Vol. 36, No. 6

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EDITORIAL

WE begin this month a short series of science-fact articles by Ben Bova which will discuss both the factual and the fanciful aspects of the possibilities of extra-terrestrial life. We are particularly pleased to be able to present this series, for although "life on other worlds" has been a rather oft-touched-upon subject recently, we feel that Bova's series approaches the topic from new angles and aspects. (For an introduction to these aspects, see page 75).

For those of you who are used to seeing Mr. Bova's name as a byline on science-fiction, we thought it might be interesting to give you some background about the man, as opposed to the author. Bova (I), was born in Philadelphia Nov. 8, 1932 (if you have misplaced your slide-rule, that makes him not quite 30 years old), and is married to—as he puts it—"an Italian dish named Rosa." They have two side dishes—Michael, almost 4, and Regina, almost 2.



He got a degree in journalism from Temple University in Philadelphia, and did graduate work at Georgetown U.'s School of Foreign Service. After some newspaper and magazine work, Ben became technical editor for Project Vanguard with the Martin Co. Later he wrote audio-visual scripts for high-school physics courses, and then directed a technical publishing company. Currently he is with Avco-Everett Research Laboratories as a technical communications executive.

His personal interests center on astronomy and anthropology. An ardent amateur astronomer, Bova is a member of the American Rock-

(Continued on page 74)

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*The men on the space station had a word for trouble
—"thunder." Always it had been thunder on earth.
Now, with the warheads decaying and the Soviets
playing a mysterious game, now there was . . .*

THUNDER in SPACE

By LESTER del REY

I

IN the little formal garden in Geneva, the guards had withdrawn discreetly, out of sight and hearing of the two men who sat on a carved marble bench in

the center of the enclosure.

The President of the United States was too old for the days of strained public and private meetings and the constant badgering of his advisers that had preceded this final, seemingly

Illustrated by FINLAY





foredoomed effort. His hands trembled as he lifted them to light a cigarette. Only his voice still held its accustomed calm.

"Then it's stalemate, Feodor Stepanovich. I can make no more concessions without risking impeachment."

The dark, massive head of the Russian Premier nodded. "Nor can I, without committing political suicide." His English was better than the rural dialect of Russian he still retained. "Call it a double checkmate. Our predecessors sowed their seeds too deep for our spades. Or should I say, too high?"

Both heads turned to the north, where a bright spot was climbing above the horizon. The space station sparkled in sunlight far above Earth, sliding with Olympian deliberation past a few visible stars until it was directly overhead. Without a timetable or a telescope, there was no way of knowing whether it was the Russian *Tsiolkovsky* or the American *Goddard*, nor did either man care. Half the world lived in almost hysterical fear of one or the other, with the rest of the human race existing in terror of both.

The Premier muttered something from the ugliness of his childhood experiences, but the President only sighed unhappily, as if sorry that his own background gave him no such expressions.

A few minutes later, the leaders separated. As they moved across the garden, their escorts surrounded them, clearing the way toward the cars that would take them to the airport. Behind them, professional diplomats stopped puzzling over the delay and began spinning obfuscations to cynical reporters. The phrases had long since lost all meaning, but the traditions of propaganda had to be maintained.

In the UN, the Israeli delegate crumpled a news dispatch and began speaking without notes, demanding that space be internationalized. It was the greatest speech of his career, and even the delegate from Egypt applauded. But national survival could not be trusted to the shaky impartiality of the UN. The resolution was vetoed by both the United States and Russia.

The Fourteenth Space Disarmament Conference was ended.

II

A MONTH later, a thousand miles above Earth and exactly 180° behind the *Tsiolkovsky*, the *Goddard* swung steadily around the globe in a two-hour circumpolar orbit. Outwardly, it looked like the great metal doughnut that space artists had pictured for decades. On the inside, however, the evidence of hasty, crash-planned work was

everywhere. The air fans whined and vibrated, the halls creaked and groaned, and the water needed to maintain balance gurgled and banged through ill-conceived piping. It was cramped and totally inadequate for the needs of the nation that had put it into space eight years before in a rush attempt to match the Russian "Sulky".

Jerry Blane should have been used to such conditions. He'd been one of the original space-struck men who'd helped to build it and then had been lucky enough to get a permanent assignment. Now he drifted in the weightless hub, watching the loading of a ship bound back for the home planet, wondering what hell's brew the boxes contained. The project that had usurped the cryogenic labs had involved its own crew of scientists, who were already on board the ship, taking their secret with them.

He shrugged, trying to dismiss the problem. The motion twitched him about, and he corrected automatically. His tall, thin body was accustomed to weightlessness.

Beside him, the head of the science corps on the station also floated in midair. The big body of Dr. Austin Peal was revealed in the single pair of shorts customary on the *Goddard*, and its darkness contrasted sharply with the blond hair and pale skin of

Blane. Only the frowns matched.

The short, intense figure of General Devlin popped into the hub from the tube elevator ahead of the pilot, Edwards. In spite of the weightlessness, the station commandant managed to pull himself to rigid attention at sight of Blane. He scowled, but held out his hand with formal correctness.

"All right, Blane. You're in charge officially until I get back," he admitted grudgingly. He obviously resented the order that left a civilian in charge while he went down to testify for the station appropriations and receive new orders. "You'll find detailed notes on my desk. I suggest you follow them to the letter."

He grabbed a handhold and began pulling himself into the airlock to the ship without waiting for a reply.

Edwards had lingered. Now he also held out his hand. "Wish me luck, Jerry," he said. "I may need it."

BECAUSE of the contents of the boxes and the presence of Devlin, Edwards had been ordered to make his landing at Canaveral, under military security. Most space work was done from Johnston Island in the Pacific; the inadequate facilities at the Cape were supposed to be used only by smaller rockets. But lately the rules were shot in a lot

of ways. Ever since the last meeting at Geneva, nothing seemed normal.

"You'll make out," Drake told him. "Our predictions give you perfect landing weather, at least."

"Yeah. Clear weather and thunder below." In the station slang, thunder stood for heavy trouble. The weather forecast didn't matter; there was always thunder below.

Edwards moved through the airlock and into his ship. A moment later, fire bloomed from the rocket tubes and the ship began moving away. In the station, motors began whining, restoring the hub's spin to match that of the rest of the *Goddard*.

From the viewing ports, Earth filled almost the entire field of vision, like a giant opal set in black velvet. More than half was covered by bright cloud masses, but the rest showed swirls and patterns of blue water, green forest and reddish brown barren patches. Over everything lay the almost fluorescent blue of atmosphere, forming a brilliant violet halo at the horizon. It looked incredibly beautiful. So, Blane thought, does a Portuguese man-of-war—until one sees the slime underneath or touches the poisoned stings.

"Why can't they leave us alone?" Peal asked, as if reading Blane's mind. "Why can't they

blow themselves up quietly without ruining our chances here?"

Blane chuckled bitterly. He'd been on vacation down there a month before, and Earth was fresher in his memory than it was to Peal. "They don't see it that way. To them, we're the danger, the biggest sword of Damocles ever invented. They look up and see us going overhead, loaded with enough megaton bombs to blast life off Earth. Every time we orbit over them, they see Armageddon right over their heads, waiting some fool's itching finger. They could risk the holocaust when everything was halfway around the world, but not when it's where they can look up and see it. Most of the thunder down there is caused by the chained lightning we're carrying up here."

It wasn't an original idea. The panic on Earth had been increasing since the building of the Russian station. Now panic bred false moves, and errors bred more panic. Sooner or later, that panic could get out of hand and bring about the very ruin they feared.

"Besides," he added, "there's the expense of keeping us up here. They think the billions needed to maintain us are pauperizing them."

"We're paying three to one on every cent we get! Even forgetting the work in astronomy, bio-

chemistry, cryogenics and high-vacuum research, our weather predictions are worth billions a year in crop returns."

Blane shrugged. "Most of our work is for the government without payment, so Congress still has to appropriate billions for us yearly. That's all the people see. We're poison down there. They'd vote to ditch us if they weren't so scared of the bombs on the *Sulky*."

"That's what comes of putting scientific tools under government control," Peal grumbled. "The stations should have been private enterprises from the beginning."

BLANE nodded automatically. It was an old argument, and it made sense. But there was no chance of the government ever letting go now. They took the clanking elevator down toward the rim, while weight built up to the normal one-third Earth gravity that was produced by the spin at the outer edge of the *Goddard*. Then they moved along the hallway that circled the rim, through the recreation hall, past the vacuum labs that were busy with some kind of military development, and past the cryogenic section, where men were busy getting ready to resume normal work. Beyond that lay the weather study section. It should have been located in the hub, but there had been too little room, and the

pickups were remotely controlled, flashing their pictures of Earth onto big screens here. Now the screens showed Madagascar to the west of them as they swung northward. Men were busy plotting the final details for next month's weather predictions.

Peal followed Blane through the side door into the little office of Devlin. The General was something of a martinet, but his discipline extended to himself. Everything was in order, and the list of instructions lay in a folder in the center of the desk. Blane glanced at it, then at the basket of communications from Earth. He grimaced, and passed some of the flimsies over to Peal. "There's more evidence, if you want to prove the profit we could show."

There were requests for projects to be done here, complaints—often angry—at projects already okayed but delayed by high-priority military research. There were applications from names already famous below. Five foundations were demanding that the lunar ships be rushed to completion.

The intercom came to life with a rasping parody of the voice of Devlin's secretary. "Mr. Blane, Captain Manners insists on seeing you. He's been waiting nearly an hour."

Blane flipped through Devlin's instructions. There was an entry on Manners there: *Troublemak-*

er, possibly paranoid. Add his figures to HQ report as routine only.

"Send him in," Blane ordered. The red-headed young captain had been assigned here only six months ago, but Blane had met him often enough to like him.

Almost at once, the connecting office door opened and Manners shoved in. He was obviously angry, but his voice didn't show it. "Thanks for seeing me, Blane. I'd just about decided you wouldn't." He slapped a piece of film down on the desk. "Here. Look at that!"

The film was slightly darkened. Blane turned it over, recognizing it as one of the strips worn by the men who worked in the bomb section to warn of any accidental exposure to radiation. But it was well under any dangerous level of exposure. He passed it to Peal, who studied it in curiosity.

"That's in five hours of routine work in the bomb bay," Manners said. "Routine work! And I checked the films before issuing them, so I know they weren't pre-exposed." He pulled out a sheet of paper covered with figures and dropped it on the desk. "The radiation's up in there again. Check it yourself if you won't accept my readings."

Peal had grabbed up the figures which listed the radiation count in various sections of the

bomb bay. They meant nothing to Blane, but the scientist tensed visibly as he studied them.

"I gather you showed your figures to Devlin," Blane said. "What did he say about them?"

Bitterness washed over Manner's face. "He told me to forget it, that readings were higher here than what I'd learned handling warheads below because we got so many cosmic rays. Three months ago, they were a lot higher, and he said there was an increase in cosmic radiation. But he okayed my getting the air pumped out of the bay so nothing hot would be sucked into the rest of the station. Last month, the figures went up to about half what they are now, and he mumbled something about a cosmic ray storm. I haven't been able to see him since then."

"There's no such thing as a cosmic ray storm," Peal said flatly. "Why wasn't this reported to me? It's partly in my province."

"General Devlin ordered me not to discuss it with anyone!"

"Thunder?" Blane asked the scientist.

"If it keeps doubling every month, it's disaster! The thin walls here are no protection from radiation. Even now, we'd better evacuate the bio labs beside the bay. Captain Manners, we'll have to check you on this. I'm not exactly doubting your word, but

these results are impossible according to anything I know." He swung to Blane. "I think you'd better come, too, Jerry. This may be something for the authorities, and you carry the weight here now."

IT was a lousy beginning to his temporary command, Blane thought. But seeing Peal's face, he simply nodded and followed the other two out into the hall. They were heading toward the bomb section when a shout went up from some of the men watching the viewing screens.

Blane swore to himself, but turned back.

He saw at once that the screens were set for top magnification, showing a section of Earth at the extreme limits of resolution. A glance at the projected coördinates showed that they were over southern Russia. His eyes were untrained at grasping details, but he saw enough to recognize that they must be viewing the great Russian rocket base that supplied the *Sulky*.

Scarfield had taken over from his subordinate and began picking out details with a moving spot of light. "Rocket—see its shadow? And there—there—there. Jerry, they've got every ship they own assembled together. And it looks as if they've been running supplies to them all. Something big's due."

"Attack?" Blane asked. One of the jobs of the station was to spot any clustering of military rockets that might presage a ground-based attack.

Scarfield shook his head. "Not a chance. Those are space rockets, not war missiles. This is like the massed flight they sent up about two years ago, remember? We never did figure out why they had to take the whole fleet out. But with what's going on below, this must mean something important. Think we should alert HQ?"

They obviously should, as soon as they were over one of their own stations. The rule was clear on that—when in doubt, shout! But meantime, they'd have to watch while still in view.

There was a faint spot of light, and Scarfield grunted. "They're blasting off! Maybe we can plot orbits and—"

The bright spot split into lances of fire, exploding savagely outwards! Every drop of mono-propellant in the tanks must have let go at once to make such a flare. Then, before Blane could catch his breath, there was another flare and another. Suddenly the whole field was a great spread of flame as the other rockets were exploded by the savage blast of the first.

Before the *Goddard* had passed beyond view, they knew that every Russian ship on the field

was totally demolished—which meant, according to Scarfield's estimate, every ship that could make the trip up to the *Sulky*.

They stared at the screen in shocked silence while Blane slowly began to realize the implications. It had happened while they were directly overhead. What would that mean to the ever-suspicious people of Russia who were already conditioned to think of the *Goddard* as their greatest enemy? What could be made of that in a world already close to the edge of panic?

III

BY the time the *Goddard* was over the North Pole where she could make radio contact with Alaska, the news was already out. For once, Tass had released the news of a catastrophe without delay. The ground radio confirmed the fact that every supply ship for the *Sulky* had been wiped out, and that the detonation had been so great that even ships being assembled nearby had been wrecked hopelessly. It would be three months before Russia could again reach her station.

Later news filtered in slowly. Most of it had to be picked up from the regular FM news broadcasts that filtered through the ionosphere. A couple of the scientists who had learned Russian

interpreted the news from Radio Moscow on their next trip over.

Surprisingly, there were no claims of American sabotage. Then Blane wondered whether it was so surprising. With the level of fear in Russia as high as elsewhere, it would probably have been a grave mistake for the leaders to suggest that any American sabotage of territory so far inside Russia was possible. The people had to count on the invulnerability of their station for what little hope they had; how that worked when the supply ships were already ruined was more than he could guess, but he had long since given up trying to understand the devious game of propaganda being played on Earth.

At least for the moment, the disaster was not being turned into another excuse to push the seemingly inevitable war another millimeter closer to the brink. Maybe the whole affair might result in some decline of tension. Once the American ships were sent up to supply the *Sulky* on an emergency basis, there might be a little good will from Russia and self-satisfaction at a good deed in America. That could give a breathing spell.

Blane had almost forgotten Manners and the worry over the strange increase in radioactivity. He had sent Manners' latest figures down with a query for in-

structions at the first chance to do so by tight-beam radio that would not leak security, and then had let the matter drop from his mind. It was several hours later when his secretary announced that Peal and Manners were in the outer office.

Manners looked both more worried and strangely satisfied, as if he were bursting to cry his I-told-you-so. But Peal's face was drained of any emotion except surprise.

The scientist nodded. "Captain Manners' figures were quite accurate. We've got to evacuate nearby sections of the station. In a way, we're lucky—radiation travels in straight lines, and the hull curves away from it here. There is about three hundred times normal radiation in there, and it's coming from inside the warheads. It isn't lethal yet—men can work there for a few hours at a time; but at the rate it's increasing, it soon will be. Any word from Earth?"

Blane dug through his in basket, and finally located a blue slip. It was in code, but Devlin's instructions included the location of the code book. He rifled through it for phrases each decagram covered. *Situation within normal expectations—results being studied here—continue as at present—will apprise if new procedure advisable—regard as utmost top secret—invoke maxi-*

mum security measures over affected personnel.

NO word," he said bitterly. Probably he wasn't even supposed to say that much, or to discuss it with the other two. But he chose to interpret the part about continuing as at present to permit the discussion to continue. He tried to focus his mind on what facts he knew. "I thought the radiation rate of the stuff in the warheads was constant, and that the casings were adequate shielding."

Peal nodded. "That's what's driving me out of my mind at the moment, Jerry. Except when it reaches critical mass, uranium-235 is supposed to have an absolutely fixed half life; it shouldn't increase under any circumstances, and the mass of each section in those bombs can't increase to become nearer critical, either. It simply can't happen, according to any physics I ever learned. But it's doing so."

"What about the effects of cosmic rays?" Blane asked. Devlin might have learned more from Earth, and even if his story to Manners had been patently untrue, it might still offer some clue.

Peal shook his head, but somewhat doubtfully. "On Earth, they're mostly only mesons from strikes by cosmic radiation. Out here, we get only the ex-

tremely hard radiation—the shielding of the ship is too thin to affect them. Maybe they might speed up the half-life a little—but they shouldn't make it increase. I've been thinking about them, too. Meteorites show a much greater decay of uranium to lead than the ores on Earth, which might indicate some effect from cosmic radiation. But unless they somehow produce another isotope from uranium that's raising the activity, I can't figure it out. We need a top level nuclear physicist for this, and we don't have one here."

They discussed it at greater length, but without adding anything to their speculations. Blane felt the hairs on the back of his neck prickling, and was conscious of a vague picture in his mind of the warheads ticking away and getting set to blast spontaneously. But he put the idea aside. Earth might be a little careless of their welfare under the pressure of emergency, but right now Earth would never risk losing the station. It was only his overactive imagination.

He finally assigned Peal and Manners back to the task of studying the matter as best they could, and tried to dismiss it from his mind. There were more than enough other worries about the station. The cryogenics lab was in trouble—the group from Earth who had used the labs had

badly depleted supplies and been careless about equipment that was common enough below but difficult to obtain here. The evacuation of the laboratories near the bomb bay threw severe strains on research, and Earth was demanding that some of it be speeded up. And the weather study was being crippled by the need to waste too much attention on detailed studies of every section of Russia. The whole station was on emergency orders to do twice as much as could possibly be done.

HE waited for news that supplies were being sent from Johnston Island to the *Sulky*, but no such news appeared. Instead, the news carried details that were only rumors of some effort of the United States to force Russia to disarm the *Sulky* unilaterally in return for the loan of eight rocket ships and launching facilities. If such an offer had been made, it must have been turned down flatly. The next day there was not even a mention of it.

When Edwards came up again, Blane sent for him at once. The pilot had made a superb landing of his ship at Canaveral, and had then been jetted back to the Island. Normally he would have taken a long layover there before making another trip up, though he had senior pilot's right to se-

lect or refuse any flight he chose. Blane was curious about his reasons for choosing the first trip he could make.

Edwards lost no time in reporting. He hadn't stopped to remove his emergency space suit, though he'd left the helmet and the oxygen tank somewhere. He clumped in, accepted coffee, and began talking even as he shucked off the suit.

"It's a wonder they even let me fly up supplies to you," he grumbled. "Jerry, it's rough down there. They've got everything sewed up under controls. I'm surprised they didn't suspect me of plotting an orbit for the *Sulky* instead of here. Damn all governments that have to mess into space affairs!"

Some of the details came out slowly, with more color than clarity. But Blane gathered that they had reacted violently to the news that the government was trying to use the emergency as a means of forcing disarmament on the Russian station.

"You mean they actually did refuse help without such an agreement?" Blane asked. He hadn't wanted to believe the rumors.

Edwards nodded angrily. "They issued a ban against any efforts to help without such agreement. They most certainly did! And you can guess how that set with us. Maybe the *Sulky's*

full of Russians, but they're Russian *spacemen*! Hell, when we were building this wheel here and one worker got thrown out into space, three of their pilots came up in ships to help find him—and one did find him. Remember? Sure you do. They hated our building here, but they wouldn't let a man die in space if they could help. So we owe them a few trips."

TWO of the pilots had tried to steal one of the ships fueled and supplied for the *Goddard*, but had been caught before they could take off. Now they were under guard, and the ships were being watched carefully. Edwards had been permitted to make the run only after a session in which it was pointed out that landing rights would be denied any ship contacting the *Sulky*. And the other pilots were almost in a state of revolt, with nearly all of the old-time ground force supporting them.

"The government can't stick to such a policy," Blane said doubtfully. "They can't gain anything. The *Sulky* must have enough supplies for existence until at least one ship can be assembled and sent up. All we'll do by holding them up is to increase the danger. They must be bluffing for a while, hoping Russia will crack, but ready to send supplies in a few days."

Edwards stared at him in surprise. "You mean you don't know?" Then he slapped his thigh in disgust. "No, of course you don't. I keep forgetting you couldn't. The *Sulky* couldn't reach you by radio with the Earth in between. Jerry, we got a beamed message on the Island from her when she went over one time. SOS. She's in trouble right now. Can't get help from her base, and can't wait for negotiations, so she tried calling us direct. Security clamped down on the message at once, but the radio operator's as much space as we are, so he made a dupe copy for the pilots. The day after the blowup at the base, the *Sulky* ran into a meteoroid big enough to rip out part of her solar boiler. She lost most of the mercury into space, and the rest isn't enough, even when she's patched. She has to operate on batteries right now, and that won't last more than another day or so."

Blane winced at the picture. A station was dependent on power for its existence. Lights, air circulation, water for balance, heat regulation, and even the growing of plants to keep the air breathable depended upon a steady supply of power. Like the *Goddard*, the *Tsiolkovsky* used a reflecting trough on top that directed the intense solar radiation onto a pipe filled with mercury which was heated to gaseous form and

operated the boiler and generator. It was far cheaper and safer than atomic power.

"The government knew of that when it refused help?" he asked incredulously.

Edwards grunted. "Didn't start their extortion plans until they knew!" Then he grinned slowly. "Funny thing, Jerry, when I checked over the supplies I brought up for you, I found some of the boxes of equipment got mixed up in shipment. They're full of cans of mercury! I left them aboard the ship, figuring you wouldn't need them here."

BLANE found his face muscles were trying to frown and smile at the same time, and he caught himself before he could laugh. He went to the door to make sure it was locked, and came back to his desk slowly.

In theory, it was entirely possible to reach the *Sulky* from the *Goddard*, and every pilot knew the general orbit. The *Sulky* and the *Goddard* each took two hours to circle Earth, with one an hour behind the other. If a ship took off outward with a reasonable use of power it could get into an ellipse around Earth that would take three hours to bring it back to its starting point—and by then, the opposite station would be at that point. The maneuver could be made both

ways with the fuel a final stage could carry easily enough.

"You don't have fuel enough," he decided.

"Nope. But you do—out in the blasted lunar ships that are still waiting appropriations."

Blane hadn't had time to think of the lunar ships during the hectic days of commanding the station. But Edwards' statement was true enough. The ships had been nearing completion for the long-desired American exploration of the Moon a year ago when Congress had eliminated appropriations for everything not connected with the current emergency. They still trailed the station a few miles in space. The workers had all returned to Earth, but the fuel still lay in the plastic balloons. The little ferry ship used between the ships and the station was still here, too. It could be used to bring the fuel back easily, since it had been equipped with tanks for moving fuel between supply rockets and the balloons.

"It wouldn't work," he said at last. "They'd spot your ship from Earth if you took off for the *Sulky*. They'd even guess where you'd gone when you didn't return on schedule. They might even refuse to let you land, and they'd probably make things impossible up here, too."

"I'll take my chances—and so will you," Edwards protested.

"Not unless it's necessary. Sure, somebody's got to make the trip. But it doesn't have to be your ship. The ferry's a lot smaller, but it can handle that much cargo and fuel on such an orbit." He grinned at Edwards' stubborn expression. "Look, you know I ran it for a year while we built the station. I can still pilot it, and Austin Peal can handle the math in computing the orbit. I'll get it over to you and you can transship the mercury, then take off on schedule. Then let Earth guess what happens."

"And what will they do to you if they find out?"

"Nothing—officially. Nobody has told me officially that the policy is against offering help, so I'll proceed in terms of the older tradition. When you let slip the trouble on the *Sulky* and I found cans of mercury stored in the ferry, what could I do but assume the station was expected to get them to the other station?" Blane grinned, feeling sudden relief from his other worries. "Besides, I don't give a darn what they do to me. I'm only temporary boss here."

Edwards nodded. "I'll take your last reason, Jerry. Only don't bother moving the ferry. I can work it over beside my ship, and it'll make your explanation sound better. Good luck. And if you do get in a jam—all the guys will be on your side."

He went out while Blane started off to find Peal. He had doubts about involving the scientist now. The man had never been part of a real space team. Yet someone had to do the preliminary computing. He had more doubts as he tried to explain things to Peal; the man listened quietly, making no comment, and with no visible approval or disapproval.

When Blane finished, Peal stood up, nodding. "Thanks for letting me in on it, Jerry. You get the fuel and I'll have the computations off the calculator by the time you get back here."

IV

THE ferry was a sausage-shaped structure of thin metal and plastic with an airlock at the front and a small reaction motor at the rear. It had been modified to hold either solid or liquid cargo and to operate off the monopropellant fuel instead of the lox and kerosene used when the station was built. There was even a plastic pipe between the cargo tank and its fuel tank to save separate filling, and no further modification was needed.

Blane took it out after checking the stowage of the mercury cans. He was slightly rusty, but he steadied down as he jockeyed into position beside one of the three lunar ships. He'd picked a

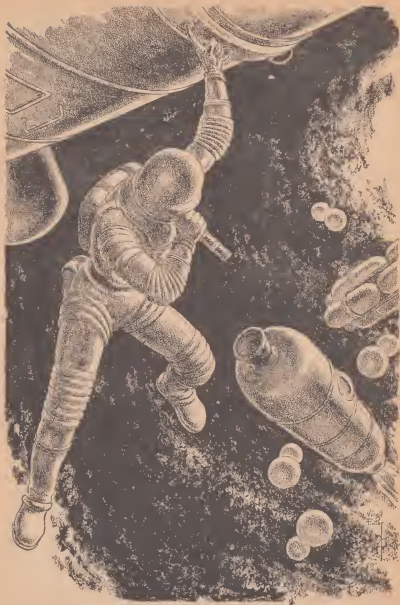
balloon on the sunward side, and the warm fuel was soon flowing into his tank, forced through a long tube by a tiny, built-in pump. When he took off again, the ferry was overloaded and sluggish, but it showed no evidence of weakness. Of course, if they ran into a meteoroid of any size, they'd be ruined—but the chances of that were very slight.

Peal was already outside the hub, dressed in space suit and clinging to a convenient handhold. He came through the lock, carrying his computations, a small telescope, and an extra spacesuit for Blane. "May need this," he suggested. "Our front end probably won't fit the seal on their hub."

Blane nodded. He should have thought of it. But his chief interest was in the orbit. It had been figured so that they would accelerate away from the station and up from Earth at low thrust, well within the limits of his power. There was a table of times and star angles to locate his correct course. Peal had done an excellent job, far better than Blane had expected.

"I spent two years on the Island," the scientist explained. "I learned a little about astrogation, though I'm no navigator. But this is a simple problem."

Essentially, it was; to make it simpler, it was always possible to make minor corrections, since



they had more than enough fuel.

"If the stations were run properly, there'd be a regular service between them," Peal suggested when they were coasting along in their orbit. "It would be cheaper to exchange supplies than to rush up a sudden emergency shipment from Earth. In fact, if a private company had built the first one, there would probably be a dozen stations by now, all connected. And we'd take over the television relay business, too."

At times, Peal sounded like the editorials from a business magazine, but Blane could find no fault with his logic. The fact was that the stations *were* basically service companies, delivering useful services for which they could collect enormous fees without complaints. But they were forced to render most of their service to a military struggle no one wanted and for which no one wanted to be forced to pay.

PEAL went on, warming to his theme. "History proves my point, Jerry. The stations have to be too complicated in function and too flexible in purpose to be run properly by men who have to think in terms of Earth politics. Every nation that ever tried controlling a major industrial set-up has found it won't work. They tried socializing rail-

roads, airlines and factories—not to mention farming—and the experiment failed. Every Russian industry today is run independently by its own board who share in the profits, no matter how much theoretical ownership rests with the government. And China is now nothing but a system of state capitalism, whatever they call it there."

"Fine," Blane admitted. "Why didn't private industry build the stations, then?"

Peal grimaced, then grinned. "That's the weak point, of course. You can't sell shares to fund a venture until the public sees the need—and they couldn't see the need of space until military pressure put the stations up and proved they had other values. But now the stations have proved themselves. The government should turn them back to private hands under long term loans, the same as they turned back factories after the war."

"They won't, though. And it's not just that no power is ever voluntarily given up," Blane pointed out. "They won't sell the stations because they're up here where no government on Earth could tax them. They might eventually, otherwise, but no government is going to lose its profit without getting taxes in return."

For a second, Peal started to argue. Then an expression of surprise crept onto his face. He

sat silently through most of the trip. Like most scientists, he'd probably considered himself a fair amateur economist, but he'd overlooked one of the most basic aspects of economy—the fact that governments also had to operate on enough of a profit to pay their executives and bondholders.

At the end of the wide-looping three hour orbit, Blane was surprised and pleased to see that he could locate the Russian station through the telescope. They had made corrections according to Peal's figures, and the scientist had proved to be a better astro-gator than could have been expected. Only a tiny corrective blast was needed to bring them into line with the *Sulky*.

AS they drew near, Blane stared in amazement. He'd seen pictures, but they had never conveyed the true feeling of the station. Russia had a tradition of building massively for space. Her early ships had been heavy and unsophisticated, relying on strength, size and power. The station was the same. It resembled the *Goddard* superficially, but it was three times as large, and must contain more than twenty times the total volume. It had a solid, substantial look that was indefinable.

The ferry contained a tiny radio, but Blane had not expected

it to be useful, since it was adjusted for the frequencies that had been used by the work forces who built the *Goddard*. He reached out and turned it on, expecting nothing. Yet there was a voice coming from it, speaking excellent English. It was a female voice, and a pleasant one.

"Ahoy, space taxi! *Tsiolkovsky* calling taxi. Oh, for Pete's sake, don't you Americans have two-way radio? Wiggle your tail or something so I'll know you're receiving, and I'll give you landing instructions!"

Peal grinned and picked up the microphone. "Ahoy, *Sulky*."

"Ah. So you can answer. Then if you can match our orbit, come beneath the hub. The smallest landing net will fit the nose of your taxi, if our records are correct. You did bring the mercury, didn't you?"

"We brought it," Peal assured her.

"Then in the name of science and humanity, I thank you. And—and I'm so glad to see you, I'll be there to kiss you welcome!"

"There are two of us," Peal started to answer, but she had clicked off. He watched as Blane began jockeying into position, cranking furiously at the little weighted wheel that controlled the angle of the ferry. "Pretty sure we'd come wasn't she?"

"Edwards had a beam antenna

on his ship. He could have tipped the *Sulky* off on his way down," Blane said. The little ship was finally lined up and he blasted forward gently against the small landing net. The nose settled firmly into a silicone doughnut that formed a perfect airtight seal. They wouldn't even need to wear spacesuits.

THERE were three girls and four men waiting for them inside the enormous hub. Six moved forward promptly to begin transferring the cans of mercury, but one girl, shorter, darker and prettier than the others, stepped forward. She kissed both of them—solemnly on both cheeks after the Russian formal fashion. Then she held out her hand.

"I'm Dr. Sonya Vartanian."

Peal introduced Blane and himself. After the handshaking, Blane gestured toward the main station, eager to see it and looking for an excuse. "I'm delighted to know you. But I think I'd better see your commanding officer."

"I'm in command." She said it quite simply. Then at their surprise she chuckled. "We don't have the male chauvinism of America. Besides, all the military officers were below when—when everything was destroyed. But perhaps you'd like to see our station?"

THERE was a great deal that was crude, and some that seemed to be handmade where American products were smoothly machine made. But generally, it was something to arouse envy in Blane. Obviously, there had been no effort made to save on costs here, and the great Russian boosters had lifted fantastic weights where American engineers had been limited to what ships of lesser thrust would carry. With no restrictions on cost or size, the Russian engineers had simply designed for what they felt desirable, rather than what was possible. The command suite was even equipped with a bar that contained a private refrigerator, though that was now off, due to the need to save power.

The quarters of the staff were spacious, and many showed signs of never having been occupied. The laboratories were beautifully equipped, and again less than a third had ever been used.

"We had great plans—but now we are limited. The threat of war makes even our leaders hesitate to begin so many long-range plans," she explained.

Peal nodded. "You see, Jerry? It's the same here. Waste and inefficiency. This place could make ten times the profit of any other comparable investment, but it's wasted under government control."

Sonya darted him a sudden

piercing gaze and stopped in her tracks. Then she laughed uncertainly. "You'll forgive me, Dr. Peal. But those words—they were just what I was going to say."

"You?" Blane stared at her doubtfully. "Isn't capitalistic talk deviationist, at least?"

"Not to an American, and sometimes now not at all." She laughed, as if relaxing from some strain. "We study American economics in our schools, just as we learn your language. Sometimes capitalism seems romantic to us—selling stocks, floating loans, such things. But sometimes I think about what could be done if this were all to be a separate nation, free for all time."

They crossed a great empty section of the station, and Blane recognized that they had already been through there twice before. He saw that Sonya was staring at him intently again as he glanced about more carefully. He moved closer to her, his eyes moving from her face to scratches on the floor and back. She shook her head faintly, and he let the question die unasked.

They ended the grand tour in her office. The power was already on, and the refrigerator was humming. There was no ice, but there was cold water for the drinks she offered them. "You might stay for dinner," she suggested.

Peal seemed embarrassed. "You'll need your supplies . . ." he began.

"Supplies?" She laughed at that. "Dr. Peal, here we have supplies to last twice our number for a year, even without a ship. You will stay?"

Blane shook his head. They'd spent too much time already. She accepted the refusal and accompanied them to the waiting taxi, holding out her hand in farewell.

"Sometime, when you need help, remember we are here," she told them. "If there should be any danger or trouble, we are anxious to offer you what we can give."

It was delivered in an almost formal tone, as if now she were rephrasing from her own language.

THE trip back was simpler than the first trip, since the ferry now carried no cargo and only half as much fuel. It responded more readily. Peal was silent until they were well away from the *Sulky*. Then he shook his head as if coming out of a brown study.

"Jerry, where do they keep their bombs? We covered every single inch of that station—we went into every room and cranny. I watched to make sure she wasn't just doubling back. She did, sometimes, but she showed us the whole thing, all the same.

And there were no bombs or missiles big enough to dump warheads on Earth. There was one place where they should have been, with what could have been outside release chutes. But it was empty, though there were scratches on the floor where missiles might have stood."

Blane nodded, remembering the place they'd been led across three times. "I know, I saw it. They don't have bombs. They had them, but they're gone. And Sonya Vartanian meant us to see it, too. She didn't quit leading us across the place until she knew I'd guessed."

WHY let us know? So we could report that they've been pulling a colossal bluff at those disarmament meetings? That doesn't make sense."

"No." Blane had been doing his own thinking. "Nobody would believe us—it's incredible, and they'd be sure we'd been duped neatly. They wouldn't dare believe us. And it isn't because Russia is too civilized to use bombs, either; that station was better designed for war than ours, and policies don't change that fast. My guess is that they've been gone from the station two years now."

Peal considered it. "That would be when we spotted the first mass of all their ships together—probably carrying the

missiles back to Earth in emergency action. Then that flight that blew up must have been set to carry new missiles up, right?"

Blane nodded. It wasn't a happy idea. It would have taken some very good reason for Russia to remove her missiles during a period of rising tension and hold off for two years before further pressures forced her to resume the idea of stockpiling weapons in space.

HE studied the distant *Goddard* through his telescope as they began to draw near. "Maybe I'm wrong, Austin. But they first put warheads out in space a couple of years before we could. And maybe those warheads began to go through a rapid increase in radioactivity a couple of years before Manners noticed that ours were doing the same. If so, it must have been a pretty serious warning to make the officials disarm the station secretly."

"The girl wanted us to see that the bombs were gone, and she couldn't talk about it. Then she put too much emphasis on that business of offering help if we were in danger." Peal grimaced. "It all adds up."

"How much longer will we have?" Blane asked.

The scientist shook his head. "I don't know, Jerry, and I'm not good enough a physicist to find out."

THE return was a letdown, after the tension they had been building between them. Blane put the ferry away, leaving no traces of the trip in it, and slipped quietly back into the hub. Things looked miserable now, cramped and forced together, after the spaciousness and richness of equipment on the other station. But he forced that bitterness from his mind.

A Congressman had stated the official policy years before. "Sure, they got something bigger and stronger. But we got the old American spirit. Didn't our boys conquer the whole British navy with nothing but little wooden sailing ships once?" And hence, of course, it didn't matter how badly matched the stations might be. Nobody bothered to comment that the American fleet had grown strong by freebooting, that both sides were using little wooden ships, and that there was never more than a small fraction of the British navy along the American coast. Facts merely got in the way of good sentiment. The Congressman had been elected three times since then and still fought hard to keep any money from getting into space, though he yelled loud and often for the need of teaching the enemy a good lesson.

Blane went to his little room,

to bathe in water that was at least hot and clean, and to change into fresh shorts. He had been gone for nearly nine hours, and fatigue had made him look older, but it wasn't too much different from his looks after a sound sleep. He went into the office, yawning. The secretary glanced up, shoved a new mountain of complaints and thunder-scripts at him, and went on answering the phone. Apparently, he hadn't been too much missed. It wasn't flattering, but he'd expected it.

Routine held him for hours, while he listened to the news from Earth. The Russians were announcing that they had never asked for help from the American supply ships, that the *Tsiolkovsky* was quite safe, and that under no conditions would any political deals be made under threats and pressure. It was done with a nastiness that lent a ring of sincerity to it.

And somewhere, the rumors seemed to indicate, America had modified her stand, and was now making overtures toward helpfulness, which were brusquely refused. There had been an obvious loss of support from some of the smaller nations in the UN, and that must have hurt.

Peal came in, looking more haggard than Blane. The scientist shook his head wearily. "The count is up in the bomb bay. I've

been trying to sound some of the chemists out about ways to test, but I don't think we can do it. We don't know what to do or to look for. But I'm convinced now that something is going on inside those casings. It must be some new isotope being created from the uranium by the action of cosmic radiation. Those energies are high enough to cause transmutation. Whatever isotope it is, it must be a neutron emitter, and it's stirring up the uranium, just as increasing the mass does. The temperature around the casings is rising."

"Still no idea of how much margin we have?"

"Not exactly. But I can get some idea from watching how the temperature rises. Maybe a few days, maybe a couple of months." Peal dropped to a couch, rubbing his eyes. "It's getting too hot in there to work without a protective screen, so we can only make short tests. But Manners and I will take turns."

HEADQUARTERS was not greatly impressed by the rise in temperature that had been noted, though the reply was longer in coming this time. It simply suggested he stand by for later orders.

That night, a large meteorite fell in Arkansas. It was metallic, and big enough so that several

hundred pounds managed to survive the burning friction of Earth's atmosphere. A large area saw the bright streak across the sky and traced it to where it fell. There its impact had knocked over trees, destroyed a house and the inhabitants, and killed a cow. There was a large hole in the ground where it had hit, and still a trace of metallic fragments around the cup.

Blane picked up the news accounts almost at once on the radio in his office. He switched the circuits around to connect all the speakers in the station and threw the master switch, giving everyone a chance to hear.

It took almost no time for the first reports to come babbling in hysterically, claiming an atomic missile had been sent down from the *Tsiolkovsky*.

The official signal from Headquarters flashed out at Blane, and he listened. They were declaring a general alert, but it wasn't red and there was still a delay. Once it went red, it would mean putting one of the plans already prepared into operation, demanding that he send his few men down into the bomb bay to set the automatic chutes into operation. Then missiles would rain down on Russian cities and bases.

Peal and Manners came in. Manners would have to carry out the orders. Blane glanced at him, and saw doubt and worry etched

across the forehead. Could any man start the holocaust going? Or, believing that the *Sulky* would be throwing bombs, as Manners must still believe, could any man refuse such an order?

Blane shook his head faintly as he met Peal's look. There were no bombs on the *Sulky*. And no bombs must fall from the *God-dard*. But in the long run, would it make any difference. There were more than enough land-based missiles to wipe out both countries. And if Blane saw them on his screens, getting set to wipe out *his* nation, could he refuse to order the bombs here into operation?

HE threw the side door of the office open and heard the mad action going on outside as men were beaming down the full power of their radio signals, giving the true nature and path of the meteorite, trying to override the frantic chaos already filling the atmosphere.

Then the light winked out. A voice that was weak and shaken came from all the speakers. "Attention. This is official! The object that fell from space has been determined to be a natural meteorite. No attack has been initiated. There is no cause for alarm . . ."

Blane cut off his speakers and went back into his cabin, shaking with reaction.

This time, there had been no holocaust. This time the alert had never gone red, and sane minds had somehow prevailed. But how long would sanity hold sway in a world where every unnatural accident was a potential trigger for a rain of bombs, a storm that might destroy most of the life on Earth and would certainly end man's adventure into space. It wouldn't really matter whether the stations managed to get off without retaliatory missiles from Earth; once the ships and supply bases were gone, there would be no possibility of continuing life here. The men who fired the missiles from these floating arsenals would be committing a long and horrible suicide. Yet he might have to order it—might reach a stage where he would even want to order it!

Peal was waiting for him with the report on the temperature of the casings when he came into the office the next day. There had been an increase of nearly two degrees, and it began to look as if the rise were an asymptotic one, that might get out of hand so quickly that there would be little warning.

"It's not much of a secret, either," the scientist stated. "I don't think Manners said anything, and I've kept it as tight as I could. But there are indirect ways of noting things going on, and the temperature gages in the

hull show signs already. The men who service the bomb bay aren't all fools, either. They can guess there's trouble when they're sent in for only minutes at a time. So rumors are spreading."

Blane nodded. If the rumors got out of hand, things would go to pot in ways that might make it impossible for them to meet an emergency later. He threw the master switch for general summons again, and began speaking slowly, choosing his words with care. He wasn't going to lie, but he couldn't give them full information. He was already violating security to an extent that could bring full official wrath on him.

He told them that there was evidence that radioactivity was leaking from the warheads, though not in any measure to endanger the station at present. He said simply that there had been some related increase in temperature noted, and that the situation was being studied and reported to Earth, where fuller analysis was possible. It was all true, so far as it went—and the impression was as false as he could make it.

BY the time the station was over Denver, where he could contact headquarters on his tightest beam, most of the rumors had died, and the men were discussing the situation without much excitement.

Surprisingly, headquarters took his report and switched him directly to a human, instead of the tape receiver he usually had to deal with. He gave the basic facts, and reported precisely on the fact that he had been forced to inform the crew of the station.

The voice from below sighed wearily across the thousand miles of space. "Quite right, Blane. Panic would be the worst thing you could have. Forget about the violation—we all have to cut that at times. Now, in regard to your basic situation, I'm going to do the best I can for you. But I wouldn't worry about your boiler trouble yet. It will be at least three days before repairs are really necessary, and before then Devlin will be back with you. He has a full grasp of what must be done. And good luck."

The voice cut off.

Blane sat staring at the wall. Three days—it could only mean that there were three days still to go before the runaway radiation inside the casings built up too high for something to be done—whether to dump the bombs or what, he couldn't guess. But that was shaving it pretty thin.

And how sure could he be that they knew what was going on? They had only his coded figures to go by. Yet he had to trust them. For once, he'd be glad when Devlin was back.

He called Manners and Peal in. "Seal off the bomb bay," he told them. "Just stick up a sign making it off limits and spread the word that nobody's to go in until Devlin gets back here—which will be in a couple of days." He grinned at their protests, and shook his head. "And that means off limits to you, too. Earth says we're safe until Devlin gets here, and he'll have orders. Until then, we can't do anything, so forget the warheads."

It would be a lot easier for the crew of the station to accept than would the sight of Peal and Manners going in and out in constant efforts to check. And there was nothing that their tests could show, anyhow; nobody here knew enough to interpret what the readings meant.

For a change, a sort of lucky accident helped him. One of the pipes in the circulating system got clogged with something that should never have reached the water and burst. It made a mess of most of one deck, and took a full day's cleaning and repairing. That type of misfortune was something the *Goddard* had long since grown used to, and the sight of great scientists working with cooks and power men was always a relief from the routine. Maybe stations should be built to fail in minor ways. If ever a ship was built to cross the vast gulf to another star, it should be as

imperfect as safety permitted.

On the surface, everything was routine by the time Devlin's ship came up the next day. Devlin must have more pull on Earth, Blane decided; something had boosted his stock. The ship had taken off from Cape Canaveral—the same ship that had taken him down—in a tricky but successful maneuver. Edwards, of course, had been called in for the job.

Blane had only a few words with the pilot, but he gathered the ship would be standing by to take Devlin off again at some undecided later time.

GENERAL Devlin came into the office with brisk, precise steps, and stood looking at Blane with a perfect picture of a military man regarding an inferior. His short body was as straight as a rod, and his head was at precisely the right posture. But his face looked grey, and a muscle under one eye twitched. He motioned sharply as Blane stood up to relinquish the seat behind the desk.

"At ease. Stay where you are. I've been cramped in a hammock for hours, I prefer to stand. I'm not taking over your command this time, anyhow. I'm merely here to execute one order before I have to report back down there. How's the trouble here?"

He listened to Blane's report, but hardly seemed to hear it. He

was apparently fully aware of everything that Blane could tell him. When it was done, he nodded. "I was told to fill you in. I'll make it brief. Dr. Peal's theory that ultra hard radiation has caused the transmutation of some of the uranium to a more dangerous isotope is correct. This effects the same results as raising the mass of each segment of the uranium trigger to critical level eventually. But there is still time to save the station, and the level of radiation will not make it dangerous for the squad to handle the missiles; they will be exposed too short a time. I would appreciate it if you would instruct Captain Manners and his men to assemble in the hub in fifteen minutes. I'll join you there."

It wasn't a lot to work on, Blane decided. But he nodded as Devlin went out, pacing toward the coffee in the rec hall. He put through the orders and shortly moved out to join the eight men and Manners. In the hub were stacked a number of boxes. He counted them, and nodded. There was one for each of the missiles.

"Looks like we dump the missiles," Manners suggested, relief heavy in his voice. "Those must be program tapes for the guidance computers on the missiles."

Devlin's voice sounded sharply behind them, bringing them to attention. If he had heard Manners, he gave no sign of it.

"In those boxes are tapes for the missiles. You are all familiar with their installation and the operation of loading the missiles into the outer chutes. Each of you will take one pile of the tapes and repair to the bomb bay. You are to enter there at precisely nine hundred. The bay is hot, but not dangerous for the length of time required to complete this operation. Captain, how long should the operation of moving all bombs into chutes require?"

"About twenty minutes, sir." There were motorized winches that did the work, and the chutes were one of the few pieces of mechanism on the *Goddard* that had not been made shoddily.

"Very good. Then at nine twenty, I shall expect you to emerge from the bomb bay and seal it again. You will then report to Mr. Blane for further instructions."

THE orders could have been given just as easily outside the bomb bay, or to Manners alone, Blane realized. The whole affair was too precise, too much by the book. He frowned as he watched Manners and the men pick up the little boxes and move toward the elevators. They were in no great hurry, since they still had fifteen minutes before they were to enter the bomb bay. Then they were gone. And Devlin shuddered faintly and began wiping his face

with a kerchief. Something cold shot up from Blane's throat to the roof of his mouth.

"What's the destination on the tapes?" he asked sharply.

Devlin stared at him or through him. Then the stiff body bent a trifle in a faint bow. "I suspect you've guessed it, Blane. They are all set to take an elliptical orbit that will bring them against the *Tsiolkovsky* in mid-Pacific."

"They can't!" But Blane knew that they could be set for just that—they had to be set for such an orbit. With their bomb stock about to become useless in a matter of a few days, and with too little time to replace them after the realization of what was happening, the military mind could decide that the only hope was to eliminate the danger from the other station. It would mean a stalemate in space, and might possibly still leave Russia doubtful enough about the striking power left on the *Goddard* to intimidate her out of retaliating.

"It would wipe men out of space!" he protested. "You've got to cancel the order."

Again Devlin gave the faint bow. "Unfortunately, I have no authority to cancel that order, Mr. Blane. I cannot do so."

Blane felt his fist move from his hip before he realized what he planned. It was an awkward blow, as all activity in nearly zero

gravity must be, but it connected. Devlin was lifted from his weak contact with the floor and his head banged savagely against the roof. He drifted back toward the deck, unconscious. Blane caught himself and dashed for the elevator. There was still time to broadcast the facts to the station and to stop the men from entering the bomb bay. After that, he no longer cared what happened to him.

VI

THE meeting Blane had called in the rec hall had been brief. Men and women had stared incredulously at him as he told them the facts—all the facts this time. There hadn't even been a vote, since none was needed. Now they were scurrying about, hastily following the orders he had given. Manners was destroying the tapes, the weather men were collecting the reports of future weather that should have been filed within the next few days, and others were gathering what bits of scientific material and notes they could. Edwards had somehow joined them and was already out in the little ferry, heading for the big lunar ship that was fueled and almost completed.

Devlin sat in the hub still. He was conscious now, but the blood on his head ruined what would otherwise have been a fine mili-

tary posture. He made his slight bow, smiling bitterly in recognition of his helplessness.

"I'm oddly grateful to you, Blane," he said. "But I don't expect you to believe me. And I find I regret what will happen to you and the men here when this catches up with you. What are your plans for me?"

Blane hadn't thought of that. He watched through the port as the ugly, clumsy lunar ship moved toward the ship, to a distance where the ferry could be used to carry them all out to it.

"You can pilot a ship, I remember. Take Edwards' ship and go back to the Island," he decided at last.

Devlin smiled. "I thought of that, too. But with your permission, I'd rather come with you. I'm curious. And I give you my word I shall not interfere in any way. Your case is hopeless, of course—but so is mine."

Blane shrugged. "Come along, then."

Loading everyone into the lunar ship was a horrible period of chaos. It had never been meant to hold such a cargo of goods and people. But somehow room was found, and Edwards began moving out and away from the *God-dard*—the station that was now empty, except for the warheads that were growing hotter with each hour.

"I've called the Island," he said

to Blane. "If the message got to anyone except some lumphead, I think they'll be waiting for us."

Blane nodded, but he found little reaction to any news now. He had made his plans in some split moment between striking Devlin and reaching the office. There was nothing now to add to them. There was only a grim determination and the hope that all spacemen must share it—the determination that somehow, men had to stay out here and find an honest destiny in space.

THREE hours later, when their long ellipse brought them within sight of the *Tsiolkovsky*, he saw that there were ships around the station. There were no more than half a dozen now, but he could see others approaching. It was impossible for all to leave at once, but the men there had elected to join him, and they had found enough sympathy among the staff of the Island to gain control long enough to accomplish their decision.

The awkward lunar ship came to a reluctant stop less than half a mile from the station, and Blane began picking those who were to go with him aboard the little ferry that was in tow. Manners and Peal and two others. He was looking for a sixth when Devlin moved into the group. Blane started to order him aside, and then shrugged.

They were almost as crowded in the taxi that Edwards piloted as they had been on the lunar ship. But there was no thought of that. The others were taking their cue from Blane, and Blane was simply waiting, frozen in his determination until events could shape his moves.

THE landing net snapped around them, and they settled into the silicone ring, and then began moving into the huge hub of the *Sulky*.

At least a dozen people were waiting there—too many, Blane realized. He hadn't bothered to consider the size of the group he must meet. But he disregarded that.

Sonya Vartanian moved forward to greet him with the double kiss and handshake. Her eyes were unreadable, but her voice was warm. "Welcome, gentlemen. I am delighted that you remembered our offer of aid in time of trouble. You have our assurance that—"

Blane cut her off with a hasty gesture. He wanted no speeches from her. It had to be done at once, or forgotten, as he had planned it. His mind had no second line of action. He began to speak authoritatively;

"In the name of the free territory of space, I seize this ship and all that is on it," he continued coldly, "I sever all ties

any may have with Earth herewith. I ban all military operations from space. I declare that no nation may own property in space, but may only trade according to the just laws and practices that shall be henceforth established for space. I—"

He was wound up to the point where he could not stop, though there was nothing more to say at the moment.

But a sudden sound choked off his words. It was a shout from those who had come to meet the crew from the *Goddard*. It was a long, surprised crescendo that slowly became a cheer.

SONYA leaned forward, grasping his hands "Thank God," she cried in his ear. "Oh thank God. I was so afraid you wouldn't see it."

He blinked, beginning to feel foolish. "You mean that you agree? Without resistance?"

"We've been trying to find some way to make it happen for two years—ever since our commander refused to permit our decaying missiles to be used against your station," she told him. "But we never really believed it could happen."

Blane knew that he had never believed it, either.

He pulled her closer, beginning to smile again. "In the name of the free territory of space!" he said, and kissed her.

THE blaze in the heavens that had signalled the end of the *Goddard* was less than twelve hours old. It had been a magnificent funeral pyre to an epoch, but it had not yet ended the methods of diplomacy. It had merely forced faster action.

The Premier of Russia and the President of the United States sat together, trying to keep their voices down and yet hear each other over the noise and confusion of the assembly hall in the UN building. They were surrounded by guards, as usual, and the television cameras were focused on them. But they had so far been unable either to agree or disagree. They could only wait until the time announced had arrived, as most of the world was now waiting.

Then the great system of amplifiers and speakers went into operation, and quiet began to descend over the hall.

There must have been a greeting of some formal kind, but few heard it. Jerry Blane's tired voice was already setting forth his written statement of demands when the quiet was sufficient for him to be heard. He read with the voice of a man not used to making a written speech sound natural, but nobody noticed.

The announcement of the facts was obvious, but it took on added

power from the brevity that compressed everything into a single focus. America had lost a station and Russia had no supply ships. There was a supply base on Johnston Island, but the ships were all in space. Earth was completely cut off from contact with space for months to come.

And Earth could no longer exist without that contact. Her next weather reports were needed within the week, and without them the damage to crops grown dependent on them might result in famine for much of Earth. Certain drugs had to be made in space. There were hundreds of needs, without which the economy of Earth would collapse. Today, in a real sense, Earth could exist only by the use of a station in space.

But the station could exist for a longer time without Earth. There was food and supplies for more than a year. They were prepared to wait, if need be.

YOU cannot use force," Blane's voice stated flatly. "For the first time, the governments of Earth cannot fall back on destruction when everything else fails. To destroy us would make your economic collapse inevitable now. You cannot go back to your past or the savage rules of your past. You can only meet us honestly and concede the just demands we propose."

Many were surprised at the proposals—the joint work of two years of thought on the *Tsiolkovsky* and a final flash of insight on the part of Blane. They wanted recognition from the UN that they were an independent territory. They wanted to incorporate as an independent stock company on Earth, under direct UN charter. For that, they were willing to pay reasonable taxes on operations done within any country. They were willing to pay a reasonable price, to be settled by a committee of neutral nations, for the two stations, for the ships—and even for the Russian ships that were destroyed—and for complete sovereignty over Johnston Island, which would now be worthless to Earth. They would pay for this by the issuing of stock, which could be redeemed in time through the profits that were easily provable as more than adequate to meet their debts. And they were to have full control of further ventures and services to be transacted on the station. Weather predictions would be on a subscription basis, research on the station would be by lease, and other services could be adjusted to a fair market value.

There was more, but much of it was only repetition to make sure all was understood. It finished with a simple request for a quick decision, since no more

business could be done with Earth until the agreements had been reached.

The President nodded. "You'll agree?" he asked.

"What else can we do?" the Premier asked in return. "He's right. We can't continue today without the services we're used to from space. A series of accidents has left us no choice."

The President settled back, apparently satisfied. But he was less sure. Had there been accidents involved? Some man must have hated war in space enough to sabotage a fleet of ships. Other men had hated that same war enough to break all discipline and strike out against a whole planet. And men and women on two separate stations had so detested the thought of being crushed in a surface struggle that they had independently schemed for this proposal.

He let his eyes rest on the delegate from Israel who was yielding to the delegate from Saudi Arabia. It didn't matter who made the resolution to accept the proposal of Blane on a tentative basis. There would be no veto possible now.

And on Earth, the tension was relaxing already. Perhaps now, even the surface enmities could be settled in time.

The Fifteenth Space Disarmament Conference was ending.

THE END

the WARRIORS

By TOM PURDOM

Non-violent resistance: a paradox in terms. Yet all mankind knows that, with another war sure to sound the death-knell of the race, that an effective non-violent means of settling disputes must be found. Here is an original approach to what may be the most important problem of our time.



Illustrated by ADKINS





LIGHTS out, the convoy crept away from the Institute. MacFarland rode in the lead car with a driver and his chief psych technician, Crawford Bell. Three flat decked personnel carriers, flying the colors of a mercenary band, Sabo's Own Highland Regiment, patrolled their flanks. The scientists rode in the third and fourth cars in the line.

Crawford Bell had hooked a computer and a full communications set to the rear of the front seat. Now he pressed a button on the commo unit.

"Fourteen," a voice said over the loudspeaker.

"What's happening in town?" Crawford Bell asked. He spoke with the slow, gentle accents of Tennessee.

"They're turning everybody out. There must be fifty guys stirring everybody up, telling them their country's in danger and they'd better fight. There's a mob coming your way."

MacFarland looked across the plain to the city. He could see thousands of hand lights and a dark shape sprawled across the plain. The sound of the crowd was so faint he decided it was still a couple of miles away.

His hands tingled with excitement. This was only his third raid. He still hadn't lost his zest for modern warfare. War was a contest played for high stakes, the fortunes of nations, and it



used every aptitude a man could have. Moving into battle under an African sky, he felt glad he didn't live in an earlier age. War was so interesting it would be a shame to spoil it with the agony and guilt of killing.

His objective was the airport. He was supposed to put Doctor Warren's team of biochemists on the midnight plane to Israel. An agent of the Department of Commerce, he had been sent to Belderkkan to talk Doctor Warren into becoming a US citizen. It had been a tricky job. Doctor Warren hadn't been anxious to change countries. Only the offer of a lab on the star ship being built by the United States had tempted him. "I'll accept your offer Mr. MacFarland—if the other members of my team accept it. Talk to them. I won't leave without them."

HARASSED by the Belderkkan Department of Trade using every weapon in the Twenty-First Century arsenal of persuasion, MacFarland had wrested a grudging decision from the other four scientists. Now all he had to do was get them out of the country. But Doctor Warren's wife had warned the Belderkkan government her husband was switching his allegiance.

MacFarland studied the crowd through his glasses. They must have half the city out there. He

knew the scientists weren't deeply committed to leaving. If the Belderkkans managed to keep them off the plane, they would probably change their minds.

"We're in for a night's work," Crawford Bell said.

To reach the airport, they had to make a half circle around the city. "We haven't lost yet," MacFarland said. "We're going fast enough to cut in front of them before they get between us and the airport."

Standing up in the moving car, he comforted himself by looking at his troops. Crawford Bell was a first-rate technician. His psych team was one of the best in the world. Sabo's mercenary "Regiment" had a global reputation, too. So did the band of mercenaries hiding in ambush. If the quality of an army counted for anything, they had a fighting chance. The position was bad but the men were superb.

He was a soldier. He thought of himself as a soldier and he planned to conduct himself like a soldier and win a victory for his country. But he couldn't use physical violence.

Thirty-eight years before, the governments of the world had finally realized international violence could no longer be tolerated. Any violence between nations, even a fist fight between private citizens from different countries, could trigger Earth's destruction.

He knew the consequences to all mankind of any physical violence. He knew it like he knew he had two legs. He also knew that if he twisted the little finger of a Belderkan citizen, the UN Inspector Corps would arrest him within hours. The World Court would sentence him to five years in prison and fine the United States far more than it could possibly gain from Albert Warren's work.

A HELICOPTER whined above them. A spotlight pinned them from the air.

"Masks," MacFarland yelled. Seconds later he peered at the night from inside a plastic hood. His mustache, rubbing against the inside of the mask, tickled his upper lip.

The helicopter didn't drop psycho-active gas. Instead, it marked them with its light so that far off the crowd would know where its quarry was. A loudspeaker begged the scientists to remember the humble people of Belderkan.

We taxed the labor of our people to give you luxury. We built you beautiful homes. We gave you women, if you wanted them, and all the laboratory equipment you desired. We gave you old age pensions. Remember the labors of our people!

A line of automobile headlights raced across the plain. MacFar-

land gave an order. The lights of the convoy jumped on.

The line of enemy cars was long and moving fast. He couldn't go around their rear and they were moving fast enough to head him off and hold him for as long as the crowd needed to surround the convoy.

He switched on his mike. "Sabo, can you break their line?"

"Right. Allenby, attack the cars!"

A personnel carrier, sixty men standing on its deck, charged the enemy vehicles. MacFarland grinned when he heard the bagpipes wail.

The carrier headed toward the tiny space between the fourth and fifth vehicles in the enemy line. It swerved suddenly and half a dozen kilted troopers jumped from the deck and landed among the enemy vehicles. Fans screamed as drivers maneuvered to avoid running them over. A second squad jumped off. A third squad landed on their heels. Soon only the piper stood on the deck of the carrier, proudly erect as his mess mates risked their lives among rampaging machines.

The enemy line disintegrated. MacFarland picked out a hole eighty yards wide and led the convoy forward. As they passed the carrier, he threw the piper a salute.

"Well done," he told the mike.

"Thank you," Sabo said.

"It was a good job," Crawford Bell said, "but we had all the advantages. Wait until it's them on foot and us mounted."

THE crowd had grown bigger. Now its roar could be heard for miles. A helicopter hovered over it, probably broadcasting the same kind of propaganda as the helicopter over the convoy.

Aiming for the airport, the convoy had left the Institute on a Northeast tack. In trying to outrun the line of cars, they had turned until they were moving due north. The mob was running north, too, and had almost placed itself between the convoy and the airport.

"Cut right," MacFarland told his driver. "Full speed ahead. See if you can cross in front of the crowd."

The helicopters spotlight irritated him. He didn't like bright lights. Turning around, he checked to see how the scientists were doing. They were all wearing masks and their positions told him nothing about their feelings. He waved and one of them waved back.

Now he could hear the helicopter over the crowd. It was describing the loss that threatened Belderk. The situation didn't demand sophisticated propaganda.

In a world of unrestricted international trade, with a hundred

and ten countries fighting to maintain high living standards, a nation had to maintain a good balance between its exports and imports. The new products talented brains could create were the key to survival. Albert Warren, inventor of several valuable life forms, creator of the currently accepted unified theory of the life process, was one of the world's most valuable natural resources. He and his colleagues were worth several battles.

Three helicopters swooped over the convoy. MacFarland ducked and looked for signs of gas. The helicopters held a position about twenty yards in front of his car and a few feet off the ground.

"Here it comes," Crawford Bell mumbled.

Men jumped out of the helicopters. MacFarland's driver reversed his engine. The convoy screamed to a halt. The men jumping from the copters hit the ground and threw themselves prostrate. In the tall grass they could be anywhere. The helicopter overhead switched off its light.

Another helicopter landed on their left flank. A dozen Belderkans climbed out and ran toward the scientists. "Don't leave us. Great men that you are, think of our needs."

From Sabo's second personnel carrier, a squad ran to intercept the pleaders before they made it

impossible for the scientists to move. The drivers of the threatened cars pulled out of the line. Arms linked, Sabo's men managed to keep the pleaders away from the scientists.

THE two cars carrying the scientists parked next to MacFarland. "No wonder you like your work," Lauchstein, the genetic engineer shouted. The other scientists didn't act so enthusiastic.

MacFarland switched on his mike. "Sabo, clear us a path through that gang up ahead. If you work fast, we can still outrun the crowd."

"We're moving out," Sabo said.

The bagpipes screamed. Sabo's men leaped from their carriers and moved out at a trot, the whole "regiment" of one hundred eighty men in the formation invented by Sabo himself and used by non-violent fighters all over the world. Half the regiment formed two parallel lines. The other half broke into three-man squads which hunted for a path through the Belderkan squads.

The Belderkans stood up in the grass. There were about fifty of them. They tried to form a line in front of the convoy, but Sabo's men jumping and blocking among them thwarted that maneuver. A leader shouted an order and the Belderkans converged on the

convoy, obviously trying to place one or two men so close to each vehicle movement would be impossible.

The Belderkans were as disciplined and agile as Sabo's troops. Men danced and jumped in the tall grass. Sabo maneuvered to break a hole in the Belderkan lines and send his two files through it, forming a corridor for the convoy. The Belderkans maneuvered to obstruct the double file and place men among the vehicles. Since they only had to hold the convoy until the crowd arrived, the Belderkans had the advantage.

"Look at it," Crawford Bell said. "It's the second time I've seen it. Look at it."

IT was a spectacle, all right. The polite dancing men, the wailing bagpipes, the bodies that never touched, never even brushed lightly. But MacFarland wasn't enjoying it. He knew how close he was to defeat. He didn't like the danger created when heated men from different nations faced each other on the battle field. So far no one had forgotten the discipline of the non-violent fighter, but the old beast still lived in the human psyche. One shove by a Belderkan or a mercenary and the tiger would roar on the plain.

His hand gripped the side of the car. Beside him Lauchstein

said something. Then he heard Doctor Umbana.

"Childish," Doctor Umbana snorted. "Ridiculous. When are people going to outgrow these silly games?"

"Probably never," Lauchstein said. "You can't change human nature."

The bagpipes screamed triumph. Sabo had outmaneuvered the Belderkans. MacFarland's driver switched on the fans and the car leaped between the lines of running men. Outside the double line, Belderkan soldiers ran to block the exit from the human alley. They were too late. When the car shot out the front of the line, the Belderkans were yards behind.

"The crowd's got us blocked," Crawford Bell said. "It took too long."

Sabo's men were climbing onto the decks of their carriers. The crowd stretched between the convey and the airport. Moving on a short radius, it could block them no matter how widely they circled.

MacFarland glanced at his watch. Eleven o'clock. "What have you got, Crawford?"

"Psycho gas'll break them up."

"No. Use psycho gas on a crowd like that and they may go berserk. It's been a long time since a human being died in a battle. I'd hate to be the man responsible for ending a winning streak."

CRAWFORD Bell tapped the keys of his computer. His eyes studied the crowd. The night before he had programmed the computer with data on Belderkan culture. Now he turned his immediate observations and trained hunches into mathematical quantities and fed them into the machine.

"You said you had some girls."

"I'm calling them now," MacFarland said.

The crowd was about five hundred yards away. The people were singing the national anthem of the Belderkan Republic. He could barely hear the loudspeaker above his head.

"Eagle nine here," a voice said on his radio.

"Eagle One. Can you see the crowd?"

"We're watching them."

"Attack. Hit them on my left."

He put the mike down. Crawford Bell was reciting a string of figures into the mike.

"Sound," the psych technician said. "Tell Sabo to keep his pipes quiet."

The helicopter still marked them with its spotlight. Its loudspeaker pleaded with the scientists. By straining his ears, he could hear some of what it said. The pleas made him a little uncomfortable.

What had he said to Doctor Umbana? "It's starship time, Doctor. We've abolished interna-

tional violence. We've conquered poverty and disease. We've explored the Solar System out to Saturn and if we haven't gone further, it's because nobody thinks it's worth the effort. Where do we go now? We can't stand still. We've developed psychological techniques that turn men into brainless slaves and the pressures of international competition are forcing us to use them. To stay free, the human race has to expand. It's star ship time and we need you."

That was still true. Doctor Warren's team belonged on a starship project, and it might as well be the United States project. But even having them on the Common Market or the Soviet Republic starship would be better than letting them stay in Belderkkan. Or would it? They were doing important research here. They were the foundation of Belderkkan's prosperity.

There was no way to reason out which was better. Settle it on the battle field and hope the right side won. If that helicopter's propaganda was bothering him, what was it doing to the scientists?

"Sabo, muffle the pipes."

THE convoy slowed down. The crowd had stopped running and started walking. Their togas, mostly emerald green and pearl white, were made from a hard

fabric that gleamed in the light from the helicopter. Through his binoculars he tried to estimate the percentage of men and the percentage of young people. The section right in front of him looked young and predominantly male. By now many of the women and the older men had fallen behind. That was something to be glad about.

In the crowd several voices screamed a war cry. Then the whole crowd shouted and started running toward the convoy.

Three personnel carriers skimmed into view on his left. He raised his binoculars and studied their passengers. It was hard to look at them with the detachment of a commander inspecting his troops. He was a young man and the girls standing on the decks of the carriers were pretty.

The carriers crossed the front of the crowd and the girls jumped off. They started undressing as soon as they hit. Running into the crowd, they offered themselves to the men.

Mike in hand, Crawford Bell leaned forward. "It's all in the timing." Tension choked his voice.

"Get it right," MacFarland growled.

There was only one girl for every dozen men, but that was enough to cause trouble. At least two men per girl forgot their patriotic fervor and yielded to op-

portunity. Other men forgot the invaders and tried to drag their comrades back to duty. Women, probably jealous, screamed curses at MacFarland's shock troops.

The personnel carriers, all their girls dropped, turned and swept along the rear of the crowd. On each deck a man tossed coins and bills at the Belderkans.

The loudspeaker above the crowd exhorted them to remember their country. The loudspeaker above the convoy shamed the scientists for using such tactics.

"Now!" Crawford Bell shouted at his mike.

MacFarland covered his ears too late. Even through his mask he heard the sound that rose from the sixth vehicle in the convoy.

It was sound mathematically calculated to shatter the nerves of the crowd. Pitch, rhythm, intensity, had been computed by Crawford Bell's machine. Even MacFarland felt hysteria creep up his back.

Its emotions shattered by the women, the money and the sound, the crowd lost its slight discipline and its great motivation. The people staggered under the triple psychological punch.

Sabo's personnel carriers swept forward and threw a cordon of men around the left of the crowd. The convoy raced toward the airport.

MACFARLAND could see the airport through his binoculars. The helicopter still marked them with its light, but the crowd was a long way behind.

"Cigarette?" Crawford Bell asked.

"No thanks. I'm keeping my mask on."

The psych technician started to take off his own mask, then changed his mind. "They're probably feeling desperate. This is when I'd start using gas."

"It's eleven fifteen. We'll be at the airport in ten minutes." His eyes narrowed. "They must have something left."

The night wind made him shiver. He adjusted the heating unit in his tweed jacket. When he looked up, he saw the lights of the runway. Then he saw the white dome of the terminal building. Before the airport fence and the airport gate, a line of men stood shoulder to shoulder.

Crawford Bell glanced at his watch. "Here's where I earn my money." His fingers tapped the computer keys.

MacFarland's stomach tingled. He wanted to jump out of the car and push the toga clad men aside with his bare hands. Days of frustration were reaching a climax.

He switched on the mike. "Sabo, we'll have to stand toe to toe with those boys and slug it out. I want you to guard our rear.

Have your men put a tight line behind us. Don't let the crowd get near the convoy."

They halted in front of the airport gate, less than twenty feet from the enemy line. The other vehicles pulled up beside them.

The scientists parked on his left. "You've done a good job," Doctor Warren said, "but it looks like we're not going any further."

"Did you bring machine guns and clubs?" Doctor Umbana asked. "If you didn't let's go home and get some sleep."

MacFarland stood up. "Gentlemen, we've got half an hour and a good crew of technicians." The line of Belderkans looked grim and unmoving. Their black faces gleamed in the light from the helicopter.

"Now," Crawford Bell said.

Again, the awful sound rose from the noisemaker. MacFarland tried to look indifferent but after the first seconds he grabbed his ears with his hands. It was the scream of pain and madness and the evil thing beyond the campfire. The faces of the Belderkans distorted with anguish.

Using noise was tricky. How hard did the air molecules have to strike the ears or how painful did the noise have to be, before sound became physical violence? The noise selected by the computer was supposed to be psychologically, but not physically, uncomfortable.

The noise ended abruptly. On MacFarland's right, one of Crawford Bell's technicians aimed a battery of lights at the enemy line. Flickering colors made shifting patterns on the faces of the Belderkan troops. The colors were supposed to create mental confusion and weaken motivation.

"Look at their faces," Doctor Warren said. "Wouldn't a club be more humane?"

TWO Belderkan trucks were parked behind the line. Technicians came out of them and set up lights which neutralized the lights of the invaders.

A jet screamed into a runway at the far end of the airport. MacFarland watched it taxi to the terminal building. It was the flight the scientists were supposed to leave on. He glanced at his watch. Twenty minutes.

This was where the human imagination met its test. The mind struggled to invent alternatives to violence. There could be no appeal to the enemy's reason. Conflicting interests clashed head on. Only maneuver and cunning could win the day.

He stepped out of the car and walked up to the Belderkan line. "How much do you want? My government'll give thousands to the man that lets us through. We can give you things money can't buy. Our loveliest women. A palace. Pleasure for the rest of

your life. Don't you like money? Wouldn't you like to be rich?"

No one answered. Walking down the line, he repeated his offer. He stopped in front of a thin, spectacled youth who couldn't possibly be older than nineteen.

"You can make your fortune in a minute. The rest of your life, you can do what you please." He named a famous beauty. "Wouldn't you like her? She's on our payroll."

The youth avoided MacFarland's eyes. "I won't be tempted. I can't be tempted."

Doctor Umbana jumped out of his car. "Oafs. Peasants. What right have you got to stop us? I'm a free man. Get out of my way."

MacFarland stepped in front of the angry biochemist. "Get back," he hissed. "Do you want to go to jail? I'll handle this."

"You're the man that brought us here. Kick them aside and drive through. Won't you go to jail for your country?"

Lauchstein bellowed with laughter. "Let MacFarland handle this," Doctor Warren said. "Pete, come on back to the car."

Doctor Umbana glared at his colleagues. "I won't stand for this. We're free scientists. We have the right to travel where we please."

MacFarland swore to himself. Already passengers were leaving

the terminal and walking toward the airliner.

The crowd, sounding even noisier than it had before, was bearing down on the airport. Sabo would hold them, of course, but their pleas to the scientists would be impossible to silence.

Crawford Bell jerked his thumb at the enemy lines. "They're carrying masks. We can't use gas on them."

MACFARLAND could see the future as plainly as if it were already a memory. The situation had a logic which could lead to only one solution. It was a solution he had been dreading since his first day in Belderkkan.

"This is no place for psych tricks." He dropped a weary hand on Crawford Bell's shoulder. "Keep working, but psych tricks won't budge those boys. They're disciplined and they're in a good position."

"You aren't giving up?"

He turned to face the Belderkkans. "So you won't be moved?" he shouted. "Well, I'm not moving either. I'm staying here until I rot. You'd better have full stomachs and big bladders if you want to keep me out of that airport."

"A fine speech," the helicopter answered, "but we don't care if you stay or not, aggressor. Only the five doctors count. You're of no importance."

Doctor Umbana raised his fist. "I won't be forced."

"Doctor Umbana," the helicopter said, "no one is forcing you to stay. How can one force a creative mind to work? We only want you to consider what you are doing. We only want you to see how much we are willing to suffer."

The jets of the airliner whined. MacFarland glanced at his watch. Five minutes.

"You've done a good job," Doctor Warren said, "and I'm certain you'll be commended by your superiors, but you've failed. I suggest we go home and sleep." His two sons were sleeping on his shoulders. They had been drugged, at their father's request, so they wouldn't see the attack on the crowd.

"Are you going to submit to this bullying?" Doctor Umbana demanded.

"I never was very interested in this project," Doctor Forbes said. "I'm only here because the rest of you want to go. And I've been listening to that helicopter. Some of that's true, you know. They must want us an awful lot to do all this."

"They don't want us," Doctor Umbana said. "They're greedy. Those people out there are only your employers. Are you going to let them treat you like a slave who doesn't have the right to change jobs? Don't you have any pride?"

"He has a point," Doctor Sani said.

"Suppose you go back now," MacFarland argued. "They'll know they can make you stay and they may not give you such good terms next time your contract is renewed."

"True," Forbes said, "but academic. You can't break their line. You might win a starvation match, but I'm not going to stay here that long. It isn't worth it to me."

"Is it worth a few more hours?" MacFarland asked. "You want to work on the starship. You know you meant it when you told me you want a chance to be on the ship. It's the biggest opportunity offered any group of scientists in history. And you admit you can't give in to this coercion without hurting your own self interest. So why not give me until dawn? There's another plane at six a.m. give me till then."

"What can you do?" Doctor Warren asked.

"I can challenge them to a duel. They won't refuse. No one ever refuses a duel."

ALL night the two sides harassed each other. Crawford Bell's technicians went up and down the enemy line, waking up any Belderkan who was sleeping on his feet. Sirens wailed. The crowd pleaded with the scientists,

insulted the invaders and sang to itself. The girls, not yet battle fatigued, tried to tempt the Belderkan troops. The helicopters continued their sermons and denunciations.

MacFarland tried to sleep on a cot beside the command car. Crawford Bell gave him a mild sedative but it didn't do much good.

"Have you ever fought a duel?" Crawford Bell asked.

"No. This is only my third raid."

"What's happened up to now is a boys game compared to that. That's for real."

"You don't have to tell me. It makes me sick to think about it."

"You don't have to do it. It's something no government can ask you to do."

"No, but the UN Secretariat approves of it and every honest psychologist approves of it, too. Let me rest. You get the junk ready."

He wondered if anything was worth a duel. The star ship wasn't. His career wasn't. So why bother? But he knew the answer and so did every soldier on the planet. Every duel fought made killing a little less likely; every duel decreased the danger modern knowledge, which hadn't been destroyed with the weapons it had made possible, would wipe out human life. It wasn't something you did for your own coun-

try. You did it for the whole human race and all the generations to come.

At five he arose from his cot. He felt groggy but that couldn't be helped.

In the chilly dawn he took off his jacket and shirt. Bare chested, he stepped into the space between his vehicles and the enemy line.

Crawford Bell handed him a public address system. "Good morning," his voice boomed. "I hope you've had a better sleep than I got. It's easy to be brave when you know your opponent won't kill you. It's easy to stand in line and look heroic and patriotic when you know I don't dare run you over with my vehicles. But how brave are you? Are you really willing to suffer for your country? I think the men of Belderkan are cowards. I think you would still be running if we had fought an old fashioned war last night."

HE paused and stroked his mustache. Then he gestured and Crawford Bell rolled the instrument forward. It was a pole on a wheeled platform. Four handles stuck out from the pole; above each handle was a set of four dials.

"Do you know what a duel is?" He made himself look at the instrument. "Have you heard in this primitive country of the

great duels fought all over the world these last few years? Have you heard of the champions produced by nations like Ghana, Israel, Costa Rica? Wouldn't you like to pretend you haven't?"

The youth he had tried to tempt the night before stepped out of the line. "I accept your challenge."

He doesn't know what he's doing, MacFarland thought. "We've got room for four at the pole. Who else accepts my challenge?"

Another man stepped forward. "I'm not afraid. I'll die if I have to."

The struggle on the faces of the men left in line was painful to watch. Three of them stepped forward at the same time. They looked at each other until, with a puzzled expression on his face, one of them waved the other two back.

MacFarland stepped up to the pole and grabbed a handle. Trying hard to keep their faces blank, the three Belderkans grabbed the other handles. One of them trembled.

Behind him the crowd murmured. He squeezed the handle. Pain shot up his arms and thudded through his body. His eyes closed. His face twisted. Holding back a scream, he made himself open his eyes and watch the dials over his handle. The dial marked by a red light was his. The other dials told him how much pain his

opponents were enduring. Each man could end his agony by releasing his handle. Each man squeezed harder. Even as they screamed, they squeezed and made the needle move a little further right.

No job, no promotion, no scientific enterprise or national need, could have made him do this. Feeling the pain hammer through his bones, he knew how weak all those motivations were.

Through slitted eyelids he saw two of his opponents fall away from the post. His dial said he was enduring more than either of them.

HE turned his face toward the other man. Clenching their handles, they grimaced at each other. MacFarland's grip tightened. His needle moved. The other needle edged past it. They hung there moaning and shaking.

Oh God, he thought. Oh God. He made himself squeeze.

Twin shrieks cut the air. Both men released their handles and fell away from the pole. MacFarland staggered in circles, bent over, clutching his stomach, trying to turn off the pain.

"Are you all right?" Crawford Bell asked.

"Look after him," he answered, still fighting the duel.

"Look after him," he heard the other man moan.

Hands grabbed him and he straightened up. When he saw the pole, he flinched. He couldn't do that again.

He grabbed the mike. "You saw that," he mumbled. "Who's next? Who wants to do that next?"

An aging man walked out of the line and took his position at the pole.

MacFarland stared at the old man's disciplined face. He had been thinking no one would dare come forward now that they had seen a duel. The old man looked tougher than any of the last group.

He stepped up to the pole and grabbed a handle.

"Relax," the Belderkan said. "This time you'll lose or the good thing will happen, but whichever it is, this will be the last time. Good luck."

Have you done this before? Farland squeezed to equal him. The old man squeezed his handle and his needle jumped a quarter of the way across the dial. MacFarland squeezed to equal him. Again pain hammered his bones. Again his face twisted and he moaned over his tortured body.

But it was necessary. It had to be done. This odd form of duelling had started twenty years before, when two groups of non-violent soldiers faced each other in the streets of Rio and tension mounted on both sides. Neither

side could accept defeat. Neither side could return home and admit it had surrendered to unarmed men because it lacked patience. In wars fought with violence, men could lose with honor. There was no honor for the loser in a non-violent battle.

Then a man had slashed his wrists and let his blood drip onto the street. "I'll die before I'll leave here," he had said.

"I'll die before I'll give in to you," a man from the opposing group had said, slashing his own wrists.

According to the UN psychologists who had studied the phenomenon, duelling was a form of therapy for the people of the world, a necessary transition from the days when men had earned their manhood by fighting wars or belonging to groups which could be proud of their warriors. The pride of nations demanded some sacrifice.

THE needle was halfway around the dial. Still the old man hung on. MacFarland squeezed harder. He was staying ahead. How much could he take? Why didn't he die of shock? He hoped for that release and fought to keep conscious and endure a little more.

His personal pride, the good of his country, and the safety of the world, demanded that he drive the contest beyond the limit

of his endurance; that he lose, if he lost, not because *he* had been afraid but because his flesh could endure no more.

He screamed and moaned and squeezed. The men in the enemy line moaned with him. He heard Crawford Bell shouting to him to let go. Was that Doctor Umbana he heard? Wasn't that the calm Doctor Warren shouting and pleading?

And the strangest of all sounds was his own voice mingling with the voice of his opponent, two screams with exactly the same pitch and intensity, the same rise and fall.

He was going to die. He wouldn't be the first. Sometimes the honor of the nation demanded that and it was necessary nations not be shamed by their citizens. Shamed nations were dangerous nations. And after all, he was only one soldier and in previous generations the sacrifice had been millions.

HE lay on the cot. Crawford Bell and a medic worked on him with hypos. Vaguely, he real-

ized the aging Belderkan lay beside him.

"It's about time you opened your eyes," Crawford Bell said. "Can you hear me?"

He nodded.

"We put you into therapeutic shock. You've been out an hour. You'll be all right."

"How's my friend there?"

"He's coming around."

A jet screamed. Lifting his head, he watched it rise into the morning.

"Doctor Warren's on it," Crawford Bell said. "So's Doctor Umbana. The Belderkans agreed to let any two of them through the line and Doctor Warren decided he didn't need all the rest of them after all. Your technique of persuasion isn't one I'd like to use, but it's effective."

He didn't have the strength to answer. It always worked out that way. After a duel, what had seemed beyond compromise suddenly became negotiable. That was the good thing the old man had spoken of. That was the knowledge which had given him that strength to endure.

THE END

Through Time and Space With Benedict Breadfruit: IV

BUT what will they do with the robot when it becomes too decrepit to move?" persisted the boy.

Breadfruit pointed to a large vat of bubbling acid in the public square. "They'll throw him in the pool, yonder, son."

—GRANDALL BARRETTON

Don't know where to go on your vacation? Here are some excellent suggestions. You can link up for two weeks with the mercury thought-pools of Kish. Or attend an endocrine-gala with the latest Aphrodite of Venus. Or, if you have lots of time, you can take out a . . .

PASSPORT TO ETERNITY

By J. G. BALLARD

IT was half past love on New Day in Zenith and the clocks were striking heaven. All over the city the sounds of revelry echoed upwards into the dazzling Martian night, but high on Sunset Ridge, among the mansions of the rich, Margot and Clifford Gorrell faced each other in glum silence.

Frowning, Margot flipped impatiently through the vacation brochure on her lap, then tossed it away with an elaborate gesture of despair.

"But Clifford, why do we have to go to the same place every summer? I'd like to do something interesting for a change. This year the Lovatts are going to the Venus Fashion Festival, and Bobo and Peter Anders have just booked into the fire beaches

at Saturn. They'll all have a wonderful time, while we're quietly taking the last boat to nowhere."

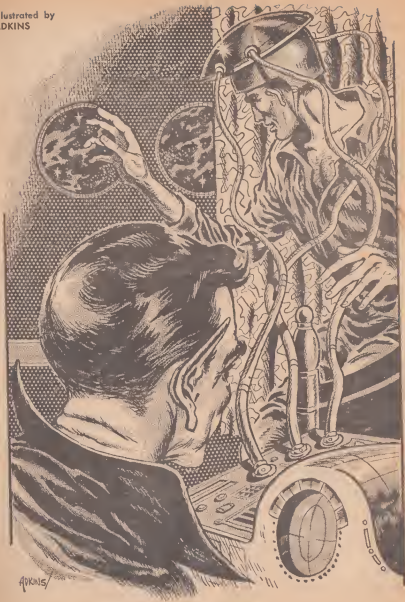
Clifford Gorrell nodded impassively, one hand cupped over the sound control in the arm of his chair. They had been arguing all evening, and Margot's voice threw vivid sparks of irritation across the walls and ceiling. Grey and mottled, they would take days to drain.

"I'm sorry you feel like that, Margot. Where would you like to go?"

Margot shrugged scornfully, staring out at the corona of a million neon signs that illuminated the city below. "Does it matter?"

"Of course. You arrange the vacation this time."

Illustrated by
ADKINS



Margot hesitated, one eye keenly on her husband. Then she sat forward happily, turning up her fluorescent violet dress until she glowed like an Algolian ray-fish.

CLIFFORD, I've got a wonderful idea! Yesterday I was down in the Colonial Bazaar, thinking about our holiday, when I found a small dream bureau that's just been opened. Something like the Dream Dromes in Neptune City everyone was crazy about two or three years ago, but instead of having to plug into whatever program happens to be going you have your own dream plays specially designed for you."

Clifford continued to nod, carefully increasing the volume of the sound-sweeper.

"They have their own studios and send along a team of analysts and writers to interview us and afterwards book a sanatorium anywhere we like for the convalescence. Eve Corbusier and I decided a small party of five or six would be best."

"Eve Corbusier," Clifford repeated. He smiled thinly to himself and switched on the book he had been reading. "I wondered when that gorgon was going to appear."

"Eve isn't too bad when you get to know her, darling," Margot told him. "Don't start read-

ing yet. She'll think up all sorts of weird ideas for the play." Her voice trailed off. "What's the matter?"

"Nothing," Clifford said wearily. "It's just that I sometimes wonder if you have any sense of responsibility at all." As Margot's eyes darkened he went on. "Do you really think that I, a supreme court justice, could take that sort of vacation, even if I wanted to? Those dream plays are packed with advertising commercials and all sort of corrupt material." He shook his head sadly. "And I told you not to go into the Colonial Bazaar."

"What are we going to do then?" Margot asked coldly. "Another honeyMoon?"

"I'll reserve a couple of singles tomorrow. Don't worry, you'll enjoy it." He clipped the hand microphone into his book and began to scan the pages with it, listening to the small metallic voice.

Margot stood up, the vanes in her hat quivering furiously. "Clifford!" she snapped, her voice dead and menacing. "I warn you, I'm not going on another honeyMoon!"

Absently, Clifford said: "Of course, dear," his fingers racing over the volume control. "Clifford!"

Her shout sank to an angry squeak. She stepped over to him, her dress blazing like a dragon,

jabbering at him noiselessly, the sounds sucked away through the vents over her head and pumped out across the echoing rooftops of the midnight city.

AS he sat back quietly in his private vacuum, the ceiling shaking occasionally when Margot slammed a door upstairs, Clifford looked out over the brilliant diadem of down-town Zenith. In the distance, by the space-port, the ascending arcs of hyperliners flared across the sky while below the countless phosphorescent trajectories of hop-cabs enclosed the bowl of roof-light in a dome of glistening hoops.

Of all the cities of the galaxy, few offered such a wealth of pleasures as Zenith, but to Clifford Gorrell it was as distant and unknown as the first Gomorrah. At 35 he was a thin-faced, prematurely aging man with receding hair and a remote abstracted expression, and in the dark sombre suit and stiff white dog-collar which were the traditional uniform of the Probate Department's senior administrators he looked like a man who had never taken a holiday in his life.

At that moment Clifford wished he hadn't. He and Margot had never been able to agree about their vacations. Clifford's associates and superiors at the

Department, all of them ten or twenty years older than himself, took their pleasures conservatively and expected a young but responsible justice to do the same. Margot grudgingly acknowledged this, but her friends who frequented the chic play-time clinics along the beach at Mira Mira considered the so-called honeyMoon trips back to Earth derisively old-fashioned a last desperate resort of the aged and infirmed.

And to tell the truth, Clifford realized, they were right. He had never dared to admit to Margot that he too was bored because it would have been more than his peace of mind was worth, but a change might do them good.

He resolved—next year.

MARGOT lay back among the cushions on the terrace divan, listening to the flamingo trees singing to each other in the morning sunlight. Twenty feet below, in the high-walled garden, a tall muscular young man was playing with a jet-ball. He had a dark olive complexion and swarthy good looks, and oil gleamed across his bare chest and arms. Margot watched with malicious amusement his efforts to entertain her. This was Trantino, Margot's play-boy, who chaperoned her during Clifford's long absences at the Probate Department.

"Hey, Margot! Catch!" He gestured with the jet-ball but Margot turned away, feeling her swim-suit slide pleasantly across her smooth tanned skin. The suit was made of one of the newer bioplastic materials, and its living tissues were still growing, softly adapting themselves to the contours of her body, repairing themselves as the fibres became worn or grimy. Upstairs in her wardrobes the gowns and dresses purred on their hangars like the drowsing inmates of some exquisite arboreal zoo. Sometimes she thought of commissioning her little Mercurian tailor to run up a bioplastic suit for Clifford—a specially designed suit that would begin to constrict one night as he stood on the terrace, the lapels growing tighter and tighter around his neck, the sleeves pinning his arms to his sides, the waist contracting to pitch him over—

"Margot!" Trantino interrupted her reverie, sailed the jet-ball expertly through the air towards her. Annoyed, Margot caught it with one hand and pointed it away, watched it sail over the wall and the roofs beyond.

TRANTINO came up to her. "What's the matter?" he asked anxiously. For his part he felt his inability to soothe Margot a reflection on his profession-

al skill. The privileges of his caste had to be guarded jealously. For several centuries now the managerial and technocratic elite had been so preoccupied with the work of government that they relied on the Templars of Aphrodite not merely to guard their wives from any marauding suitors but also to keep them amused and contented. By definition, of course, their relationship was platonic, a pleasant revival of the old chivalrous ideals, but sometimes Trantino regretted that the only tools in his armory were a handful of poems and empty romantic gestures. The Guild of which he was a novitiate member was an ancient and honored one, and it wouldn't do if Margot began to pine and Mr. Gorrell reported him to the Masters of the Guild.

"Why are you always arguing with Mr. Gorrell?" Trantino asked her. One of the Guild's axioms was 'The husband is *always* right'. Any discord between him and his wife was the responsibility of the play-boy.

Margot ignored Trantino's question. "Those trees are getting on my nerves," she complained fractiously. "Why can't they keep quiet?"

"They're mating," Trantino told her. He added thoughtfully: "You should sing to Mr. Gorrell."

Margot stirred lazily as the shoulder straps of the sun-suit

unclasped themselves behind her back. "Tino," she asked, "what's the most unpleasant thing I could do to Mr. Gorrell?"

"Margot!" Trantino gasped, utterly shocked. He decided that an appeal to sentiment, a method of reconciliation despised by the more proficient members of the Guild, was his only hope. "Remember, Margot, you will always have me."

He was about to permit himself a melancholy smile when Margot sat up abruptly.

"Don't look so frightened, you fool! I've just got an idea that should make Mr. Gorrell sing to me."

She straightened the vanes in her hat, waited for the sun-suit to clasp itself discreetly around her, then pushed Trantino aside and stalked off the terrace.

CLIFFORD was browsing among the spools in the library, quietly listening to an old 22nd Century abstract on systems of land tenure in the Trianguli.

"Hello, Margot, feel better now?"

Margot smiled at him coyly. "Clifford, I'm ashamed of myself. Do forgive me." She bent down and nuzzled his ear. "Sometimes I'm very selfish. Have you booked our tickets yet?"

Clifford disengaged her arm and straightened his collar. "I

called the agency, but their bookings have been pretty heavy. They've got a double but no singles. We'll have to wait a few days."

"No, we won't," Margot exclaimed brightly. "Clifford, why don't you and I take the double? Then we can really be together, forget all that ship-board nonsense about never having met before."

Puzzled, Clifford switched off the player. "What do you mean?"

Margot explained. "Look, Clifford, I've been thinking that I ought to spend more time with you than I do at present, really share your work and hobbies. I'm tired of all these play-boys." She drooped languidly against Clifford, her voice silky and reassuring. "I want to be with you, Clifford. *Always.*"

Clifford pushed her away. "Don't be silly, Margot," he said with an anxious laugh. "You're being absurd."

"No, I'm not. After all, Harold Kharkov and his wife haven't got a play-boy and she's very happy."

Maybe she is, Clifford thought, beginning to panic. Kharkov had once been the powerful and ruthless director of the Department of Justice, now was a third-rate attorney hopelessly trying to eke out a meagre living on the open market, dominated by his wife and forced to spend virtually 24 hours a day with her. For a mo-

ment Clifford thought of the days when he had courted Margot, of the long dreadful hours listening to her inane chatter. Trantino's real role was not to chaperone Margot while Clifford was away but while he was at home.

"Margot, be sensible," he started to say, but she cut him short. "I've made up my mind, I'm going to tell Trantino to pack his suitcase and go back to the Guild." She switched on the spool player, selecting the wrong speed, smiling ecstatically as the reading head grated loudly and stripped the coding off the record. "It's going to be wonderful to share everything with you. Why don't we forget about the vacation this year?"

A facial tic from which Clifford had last suffered at the age of ten began to twitch ominously.

TONY Harcourt, Clifford's personal assistant, came over to the Gorrell's villa immediately after lunch. He was a brisk, polished young man, barely controlling his annoyance at being called back to work on the first day of his vacation. He had carefully booked a sleeper next to Dolores Costane, the most beautiful of the Jovian Heresiarch's vestals, on board a leisure-liner leaving that afternoon for Venus, but instead of enjoying the fruits of weeks of blackmail and in-

trigue he was having to take part in what seemed a quite uncharacteristic piece of Gorrell whimsy.

He listened in growing bewilderment as Clifford explained.

"We were going to one of our usual resorts on Luna, Tony, but we've decided we need a change. Margot wants a vacation that's different. Something new, exciting, original. So go round all the agencies and bring me their suggestions."

"All the agencies?" Tony queried. "Don't you mean just the registered ones?"

"All of them," Margot told him smugly, relishing every moment of her triumph.

Clifford nodded, and smiled at Margot benignly.

"But there must be 50 or 60 agencies organizing vacations," Tony protested. "Only about a dozen of them are accredited. Outside Empyrean Tours and Union-Galactic there'll be absolutely nothing suitable for you."

"Never mind," Clifford said blandly. "We only want an idea of the field. I'm sorry, Tony, but I don't want this all over the Department and I know you'll be discreet."

Tony groaned. "It'll take me weeks."

"Three days," Clifford told him. "Margot and I want to leave here by the end of the week." He looked longingly over his shoulder for the absent Trantino. "Be-

lieve me, Tony, we really need a holiday."

FIFTY-SIX travel and vacation agencies were listed in the Commercial Directory, Tony discovered when he returned to his office in the top floor of the Justice building in down-town Zenith, all but eight of them alien. The Department had initiated legal proceedings against five, three had closed down, and eight more were fronts for other enterprises.

That left him with forty to visit, spread all over the Upper and Lower Cities and in the Colonial Bazaar, attached to various mercantile, religious and paramilitary organizations, some of them huge concerns with their own police and ecclesiastical forces, others sharing a one-room office and transceiver with a couple of other shoestring firms.

Tony mapped out an itinerary, slipped a flask of Five-Anchor Neptunian Rum into his hip pocket and dialled a helicab.

The first was ARCO PRODUCTIONS INC., a large establishment occupying three levels and a bunker on the fashionable west side of the Upper City. According to the Directory they specialized in hunting and shooting expeditions.

The helicab put him down on the apron outside the entrance.

Massive steel columns reached up to a reinforced concrete portico, and the whole place looked less like a travel agency than the last redoubt of some interstellar Seigfreid. As he went in a smart jackbooted guard of janissaries in black and silver uniforms snapped to attention and presented arms.

Everyone inside the building was wearing a uniform, moving about busily at standby alert. A huge broad-shouldered woman with sergeant's stripes handed Tony over to a hard-faced Martian colonel.

I'M making some inquiries on behalf of a wealthy Terran and his wife," Tony explained. "They thought they'd do a little big-game hunting on their vacation this year. I believe you organize expeditions."

The colonel nodded curtly and led Tony over to a broad map-table. "Certainly. What exactly have they in mind?"

"Well, nothing really. They hoped you'd make some suggestions."

"Of course." The colonel pulled out a memo-tape. "Have they their own air and land forces?"

Tony shook his head. "I'm afraid not."

"I see. Can you tell me whether they will require a single army corps, a combined task force or—"

"No," Tony said. "Nothing as big as that."

"An assault party of brigade strength? I understand. Quieter and less elaborate. All the fashion today." He switched on the star-map and spread his hands across the glimmering screen of stars and nebulae. "Now the question of the particular theatre. At present only three of the game reserves have open seasons. Firstly the Procyon system; this includes about 20 different races, some of them still with only atomic technologies. Unfortunately there's been a good deal of dispute recently about declaring Procyon a game reserve, and the Resident of Alschain is trying to have it admitted to the Pan-Galactic Conference. A pity, I feel," the colonel added, reflectively stroking his steel-grey moustache. "Procyon always put up a great fight against us and an expedition there was invariably lively."

Tony nodded sympathetically. "I hadn't realized they objected."

The colonel glanced at him sharply. "Naturally," he said. He cleared his throat. "That leaves only the Ketab tribes of Ursa Major, who are having their Millennial Wars, and the Sudor Martines of Orion. They are an entirely new reserve, and your best choice without doubt. The ruling dynasty died out recently, and a

war of succession could be conveniently arranged."

TONY was no longer following the colonel, but he smiled intelligently.

"Now," the colonel asked, "what political or spiritual creeds do your friends wish to have invoked?"

Tony frowned. "I don't think they want any. Are they absolutely necessary?"

The colonel regarded Tony carefully. "No," he said slowly. "It's a question of taste. A purely military operation is perfectly feasible. However, we always advise our clients to invoke some doctrine as a *casus belli*, not only to avoid adverse publicity and any feelings of guilt or remorse, but to lend color and purpose to the campaign. Each of our field commanders specializes in a particular ideological pogrom, with the exception of General Westerling. Perhaps your friends would prefer him?"

Tony's mind started to work again. "Schapiro Westerling? The former Director-General of Graves Commission?"

The colonel nodded. "You know him?"

Tony laughed. "Know him? I thought I was prosecuting him at the current Nova Trials. I can see that we're well behind with the times." He pushed back his chair. "To tell the truth I don't

think you've anything suitable for my friends. Thanks all the same."

The colonel stiffened. One of his hands moved below the desk and a buzzer sounded along the wall.

"However," Tony added, "I'd be grateful if you'd send them further details."

The colonel sat impassively in his chair. Three enormous guards appeared at Tony's elbow, idly swinging energy truncheons.

"Clifford Gorrell, Stellar Probate Division, Department of Justice," Tony said quickly.

He gave the colonel a brief smile and made his way out, cursing Clifford and walking warily across the thickly-piled carpet in case it had been mined.

THE next one on his list was the A-Z JOLLY JUBILEE COMPANY, alien and unregistered, head office somewhere out of Betelgeuse. According to the Directory they specialized in 'all-in cultural parties and guaranteed somatic weekends.' Their premises occupied the top two tiers of a hanging garden in the Colonial Bazaar. They sounded harmless enough but Tony was ready for them.

"No," he said firmly to a lovely Antarean wraith-fern who shyly raised a frond to him as he crossed the terrace. "Not today."

Behind the bar a fat man in an asbestos suit was feeding sand to a siliconic fire-fish swimming round in a pressure brazier.

"Damn things," he grumbled, wiping the sweat off his chin and fiddling aimlessly with the thermostat. "They gave me a booklet when I got it, but it doesn't say anything about it eating a whole beach every day." He spaded in another couple of shovels from a low dune of sand heaped on the floor behind him. "You have to keep them at exactly 5750°K. or they start getting nervous. Can I help you?"

"I thought there was a vacation agency here," Tony said.

"Sure. I'll call the girls for you." He pressed a bell.

"Wait a minute," Tony cut in. "You advertise something about cultural parties. What exactly are they?"

The fat man chuckled. "That must be my partner. He's a professor at Vega Tech. Likes to keep the tone up." He winked at Tony.

Tony sat on one of the stools, looking out over the crazy spiral roof-tops of the Bazaar. A mile away the police patrols circled over the big apartment batteries which marked the perimeter of the Bazaar, keeping their distance.

A tall slim woman appeared from behind the foliage and

sauntered across the terrace to him. She was a Canopan slave, hot-housed out of imported germ, a slender green-skinned beauty with moth-like fluttering gills.

The fat man introduced Tony. "Lucille, take him up to the arbour and give him a run through."

Tony tried to protest but the pressure brazier was hissing fiercely. The fat man started feeding sand in furiously, the exhaust flames flaring across the terrace.

Quickly, Tony turned and backed up the stairway to the arbour. "Lucille," he reminded her firmly, "this is strictly cultural, remember."

HALF an hour later a dull boom reverberated up from the terrace.

"Poor Jumbo," Lucille said sadly as a fine rain of sand came down over them.

"Poor Jumbo," Tony agreed, sitting back and playing with a coil of her hair. Like a soft sinuous snake, it circled around his arm, sleek with blue oil. He drained the flask of Five-Anchor and tossed it lightly over the balustrade. "Now tell me more about these Canopan prayer-beds. . . ."

WHEN, after two days, Tony reported back to the Gorrells he looked hollow-eyed and ex-

hausted, like a man who had been brain-washed by the Wardens.

"What happened to you?" Margot asked anxiously, "we thought you'd been going round the agencies."

"Exactly," Tony said. He slumped down in a sofa and tossed a thick folder across to Clifford. "Take your pick. You've got about 250 schemes there in complete detail, but I've written out a synopsis which gives one or two principal suggestions from each agency. Most of them are out of the question."

Clifford unclipped the synopsis and started to read through it.

- (1) ARCO PRODUCTIONS INC. Unregistered. Private subsidiary of Sagittarius Security Police.

Hunting and shooting. Your own war to order. Raiding parties, revolutions, religious crusades. In anything from a small commando squad to a 3,000-ship armada. ARCO provide publicity, mock War Crimes Tribunal, etc. Samples:

(a) Operation Torquemada. 23-day expedition to Bellatrix IV. 20-ship assault corps under Admiral Storm Wengen. Mission: liberation of (imaginary) Ter-ran hostages. Cost: 300,000 credits.

(b) Operation Klingsor 15-year crusade against Urza Major. Combined task force of 2,500

ships. Mission: recovery of runic memory dials stolen from client's shrine.

Cost: 500 billion credits (ARCO will arrange lend-lease but this is dabbling in realpolitik).

- (2) ARENA FEATURES INC. Unregistered. Organizers of the Pan-Galactic Tournament held tri-millennially at the Sun Bowl, 2-Heliopolis, NGC 3599.

Every conceivable game in the Cosmos is played at the tournament and so formidable is the opposition that a winning contestant can virtually choose his own apotheosis. The challenge round of the Solar Megathlon, Group 3 (that is, for any being whose function can be described, however loosely, as living) involves Quantum Jumping, 7-dimensional Maze Ball and Psycho-kinetic Bridge (pretty tricky against a telepathic Ketos D'Oma). The only Terran ever to win an event was the redoubtable Chippy Yerkes of Altair 5 The Clowns, who introduced the unplayable blank Round Dice. Being a spectator is as exhausting as being a contestant, and you're well advised to substitute.

Cost: 100,000 credits/day.

- (3) AGENCE GENERALE DE TOURISME. Registered. Venus.

Concessionaires for the Colony Beatific on Lake Virgo, the Man-

drake Casino Circuit and the Miramar-Trauma Senso-channels. Dream-baths, vu-dromes, endocrine-galas. Darleen Costello is the current Aphrodite and Laurence Mandell makes a versatile Lothario. Plug into these two from 30:30 VST. Room and non-denominational bath at the Gomorrah-Plaza on Mount Venus comes to 1,000 credits a day, but remember to keep out of the Zone. It's just too erotogenous for a Terran.

- (4) TERMINAL TOURS LTD. Unregistered. Earth.

For those who want to get away from it all the *Dream of Osiris*, an astral-rigged, 1,000-foot leisure-liner is now fitting out for the Grand Tour. Round-cosmos cruise, visiting every known race and galaxy.

Cost: Doubles at a flat billion, but it's cheap when you realize that the cruise lasts for ever and you'll never be back.

- (5) SLEEP TRADERS. Unregistered.

A somewhat shadowy group who handle all dealings on the Blue Market, acting as a general clearing house and buying and selling dreams all through the Galaxy.

Sample: Like to try a really new sort of dream? The Set Corrani Priests of Theta Piscium will link you up with the sacred

electronic thought-pools in the Desert of Kish. These mercury lakes are their ancestral memory banks. Surgery is necessary but be careful. Too much cortical damage and the archetypes may get restive. In return one of the Set Corrani (polysexual delta-humanoids about the size of a walking dragline) will take over your cerebral functions for a long weekend. All these transactions are done on an exchange basis and SLEEP TRADERS charge nothing for the service. But they obviously get a rake-off, and may pump advertising into the lower medullary centres. Whatever they're selling I wouldn't advise anybody to buy.

(6) THE AGENCY. Registered. M33 in Andromeda.

The executive authority of the consortium of banking trusts floating Schedule D, the fourth draw of the gigantic PK pyramid lottery sweeping all through the continuum from Sol III out to the island universes. Trance-cells everywhere are now recruiting dream-readers and ESPerceptionists, and there's still time to buy a ticket. There's only one number on all the tickets—the winning one—but don't think that means you'll get away with the kitty. THE AGENCY has just launched UNILIV, the emergency relief fund for victims of Schedule C who lost their deposits and

are now committed to paying off impossible debts, some monetary, some moral (if you're unlucky in the draw you may find yourself landed with a guilt complex that would make even a Colonus Rex look sad.)

Cost: 1 credit—but with an evaluation in the billions if you have to forfeit.

(7) ARCTURIAN EXPRESS. Unregistered.

Controls all important track events. The racing calendar this year is a causal and not a temporal one and seems a little obscure, but most of the established classics are taking place.

(a) The Rhinoceros Derby. Held this year at Betelgeuse Springs under the rules of the Federation of Amorphs. First to the light horizon. There's always quite a line-up for this one and any form of vehicle is allowed—rockets, beams, racial migrations, ES thought patterns—but frankly it's a waste of effort. It's not just that by the time you're out of your own sight you're usually out of your mind as well, but the Nils of Rigel, who always enter a strong team, are capable of instantaneous transmission.

(b) The Paraplegic Handicap. Recently instituted by the Proctists of Lambda Scorpio. The course measures only 0.00015 mm., but that's a long way to urge an Aldebaran Torpid. They

are giant viruses embedded in bauxite mountains, and by varying their pressure differentials it's sometimes possible to tickle them into a little life. K 2 on Regulus IX is holding the big bets, but even so the race is estimated to take about 50,000 years to run.

(8) NEW FUTURES INC. Unregistered.

Tired of the same dull round? NEW FUTURES will take you right out of this world. In the island universes the continuum is extra-dimensional, and the time channels are controlled by rival cartels. The element of chance apparently plays the time role, and it's all even more confused by the fact that you may be moving around in someone else's extrapolation.

In the tourist translation manual 185 basic tenses are given, and of these 125 are future conditional. No verb conjugates in the present tense, and you can invent and copyright your own irregulars. This may explain why I got the impression at the bureau that they were only half there.

Cost: simultaneously 3, 270 and 2,000,000 credits. They refuse to quibble.

(9) SEVEN SIRENS. Registered. Venus.

A subsidiary of the fashion

trust controlling senso-channel Astral Eve.

Ladies, like to win your own beauty contest? Twenty-five of the most beautiful creatures in the Galaxy are waiting to pit their charms against yours, but however divine they may be—and two or three of them, such as the Flamen Zilla QuelQueen (75-9-25) and the Orthodox Virgin of Altair (76-953-?) certainly will be—they'll stand no chance against you. Your specifications will be defined as the ideal ones.

(10) GENERAL ENTERPRISES INC. Registered.

Specialists in culture cycles, world struggles, ethnic trends. Organize vacations as a sideline. A vast undertaking for whom ultimately we all work. Their next venture, epoch-making by all accounts, is starting now, and everybody will be coming along. I was politely but firmly informed that it was no use worrying about the cost. When I asked—

BEFORE Clifford could finish one of the houseboys came up to him.

"Priority Call for you, sir."

Clifford handed the synopsis to Margot. "Tell me if you find anything. It looks to me as if we've been wasting Tony's time."

He left them and went through to his study.

"Ah, Gorrell, there you are." It was Thornwall Harrison, the attorney who had taken over Clifford's office. "Who the hell are all these people trailing in to see you night and day? The place looks like Colonial Night at the Arena Circus. I can't get rid of them."

"Which people?" Clifford asked. "What do they want?"

"You, apparently," Thornwall told him. "Most of them thought I was you. They've been trying to sell me all sorts of crazy vacation schemes. I said you'd already gone on your vacation and I myself never took one. Then one of them pulled a hypodermic on me. There's even an Anti-Cartel agent sleuthing around, wants to see you about block bookings. Thinks you're a racketeer."

BACK in the lounge Margot and Tony were looking out through the terrace windows into the boulevard which ran from the Gorrell's villa to the level below.

A long column of vehicles had pulled up under the trees: trucks, half-trucks, huge Telesenso studio location vans and several sleek white ambulances. The drivers and crew-men were standing about in little groups in the shadows, quietly watching the villa. Two or three radar scanners on the vans were rotat-

ing, and as Clifford looked down a convoy of trucks drove up and joined the tail of the column.

"Looks like there's going to be quite a party," Tony said. "What are they waiting for?"

"Perhaps they've come for us?" Margot suggested excitedly.

"They're wasting their time if they have," Clifford told her. He swung round on Tony. "Did you give our names to any of the agencies?"

Tony hesitated, then nodded. "I couldn't help it. Some of those outfits wouldn't take no for an answer."

Clifford clamped his lips and picked the synopsis off the floor. "Well, Margot, have you decided where you want to go?"

Margot fiddled with the synopsis. "There are so many to choose from."

Tony started for the door. "Well, I'll leave you to it." He waved a hand at them. "Have fun."

"Hold on," Clifford told him. "Margot hasn't made up her mind yet."

"What's the hurry?" Tony asked. He indicated the line of vehicles outside, their crews now climbing into their driving cabs and turrets. "Take your time. You may bite off more than you can chew."

"Exactly. So as soon as Margot decides where we're going

you can make the final arrangements for us and get rid of that menagerie."

"But Clifford, give me a chance."

"Sorry. Now Margot, hurry up."

MARGOT flipped through the synopsis, screwing up her mouth. "It's so difficult, Clifford, I don't really like any of these. I still think the best agency was the little one I found in the Ba-zaar."

"No," Tony groaned, sinking down on a sofa. "Margot, please, after all the trouble I've gone to."

"Yes, definitely that one. The dream bureau. What was it called—"

Before she could finish there was a roar of engines starting up in the boulevard. Startled, Clifford saw the column of cars and trucks churn across the gravel towards the villa. Music, throbbing heavily, came down from the room above, and a sick musky odor seeped through the air.

Tony pulled himself off the sofa. "They must have had this place wired," he said quickly. "You'd better call the police. Believe me, some of these people don't waste time arguing."

Outside three helmeted men in brown uniforms ran past the terrace, unwinding a coil of fuse wire. The sharp hissing sound

of para-rays sucked through the air from the drive.

Margot hid back in her slumber seat. "Trantino!" she wailed.

Clifford went back into his study. He switched the transceiver to the emergency channel.

Instead of the police signal a thin automatic voice beeped through. "Remain seated, remain seated. Take-off in zero two minutes, Purser's office on G Deck now—"

Clifford switched to another channel. There was a blare of studio applause and a loud untentious voice called out:

"And now over to brilliant young Clifford Gorrell and his charming wife Margot about to enter their dream-pool at the fabulous Riviera-Neptune. Are you there, Cliff?"

Angrily, Clifford turned to a third. Static and morse chattered, and then someone rapped out in a hard iron tone: "Colonel Sapt is dug in behind the swimming pool. Enfilade along the garage roof—"

Clifford gave up. He went back to the lounge. The music was deafening. Margot was prostrate in her slumber-seat, Tony down on the floor by the window, watching a pitched battle raging in the drive. Heavy black palls of smoke drifted across the terrace, and two tanks with stylized archers emblazoned on their turrets were moving up past the burning

wrecks of the studio location vans.

"They must be Arco's!" Tony shouted. "The police will look after them, but wait until the extra-sensory gang take over!"

CROUCHING behind a low stone parapet running off the terrace was a group of waiters in dishevelled evening dress, lab technicians in scorched white overalls and musicians clutching their instrument cases. A bolt of flame from one of the tanks flickered over their heads and crashed into the grove of flamingo trees, sending up a shower of sparks and broken notes.

Clifford pulled Tony to his feet. "Come on, we've got to get out of here. We'll try the library windows into the garden. You'd better take Margot."

Her yellow beach robe had apparently died of shock, and was beginning to blacken like a dried-out banana skin. Discreetly averting his eyes, Tony picked her up and followed Clifford out into the hall.

Three croupiers in gold uniforms were arguing hotly with two men in white surgeons coats. Behind them a couple of mechanics were struggling a huge vibrobath up the stairs.

The foreman came over to Clifford. "Gorrell?" he asked, consulting an invoice. "Trans-Ocean." He jerked a thumb at

the bath. "Where do you want it?"

A surgeon elbowed him aside. "Mr. Gorrell?" he asked suavely. "We are from Cerebro-Tonic Travel. Please allow me to give you a sedative. All this noise—"

Clifford pushed past him and started to walk down the corridor to the library, but the floor began to slide and weave.

He stopped and looked around unsteadily.

Tony was down on his knees, Margot flopped out of his arms across the floor.

Someone swayed up to Clifford and held out a tray.

On it were three tickets.

Around him the walls whirled.

HE woke in his bedroom, lying comfortably on his back, gently breathing a cool amber air. The noise had died away, but he could still hear a vortex of sound spinning violently in the back of his mind. It spiralled away, vanished, and he moved his head and looked around.

Margot was lying asleep beside him, and for a moment he thought that the attack on the house had been a dream. Then he noticed the skull-plate clamped over his head, and the cables leading off from a boom to a large console at the foot of the bed. Massive spools loaded with magnetic tape waited in the projector ready to be played.

The real nightmare was still to come! He struggled to get up, found himself clamped in a twilight sleep, unable to move more than a few centimetres.

He lay there powerlessly for ten minutes, tongue clogging his mouth like a wad of cotton-wool when he tried to shout. Eventually a small neatly featured alien in a pink silk suit opened the door and padded quietly over to them. He peered down at their faces and then turned a couple of knobs on the console.

Clifford's consciousness began to clear. Beside him Margot stirred and woke.

The alien beamed down pleasantly. "Good evening," he greeted them in a smooth creamy voice. "Please allow me to apologize for any discomfort you have suffered. However, the first day of a vacation is often a little confused."

Margot sat up. "I remember you. You're from the little bureau in the Bazaar." She jumped round happily. "Clifford!"

The alien bowed. "Of course, Mrs. Gorrell. I am Dr. Terence Sotal-2 Burlington, Professor—Emeritus," he added to himself as an afterthought, "—of Applied Drama at the University of Alpha Leporis, and the director of the play you and your husband are to perform during your vacation."

Clifford cut in: "Would you

release me from this machine immediately? And then get out of my house! I've had—"

"Clifford!" Margot snapped. "What's the matter with you?"

Clifford dragged at the skull plate and Dr. Burlington quietly moved a control on the console. Part of Clifford's brain clouded and he sank back helplessly.

"Everything is all right, Mr. Gorrell," Dr. Burlington said.

"Clifford," Margot warned him. "Remember your promise." She smiled at Dr. Burlington. "Don't pay any attention to him, Doctor. Please go on."

"Thank you, Mrs. Gorrell." Dr. Burlington bowed again, as Clifford lay half-asleep, groaning impotently.

THE play we have designed for you," Dr. Burlington explained, "is an adaptation of a classic masterpiece in the Diphenyl 2-4-6 Cyclopropane canon, and though based on the oldest of human situations, is nonetheless fascinating. It was recently declared the outright winner at the Mira Nuptial Contest, and will always have a proud place in the private repertoires. To you, I believe, it is known as 'The Taming of the Shrew.'"

Margot giggled and then looked surprised. Dr. Burlington smiled urbanely. "However, allow me to show you the script." He excused himself and slipped out.

Margot fretted anxiously, while Clifford pulled weakly at the skull-plate.

"Clifford, I'm not sure that I like this altogether. And Dr. Burlington does seem rather strange. But I suppose it's only for three weeks."

Just then the door opened and a stout bearded figure, erect in a stiff blue uniform, white yachting cap jauntily on his head, stepped in.

"Good evening, Mrs. Gorrell." He saluted Margot smartly, "Captain Linstrom." He looked down at Clifford. "Good to have you aboard, sir."

"Aboard?" Clifford repeated weakly. He looked around at the familiar furniture in the room, the curtains drawn neatly over the windows. "What are you raving about? Get out of my house!"

The Captain chuckled. "Your husband has a sense of humor, Mrs. Gorrell. A useful asset on these long trips. Your friend Mr. Harcourt in the next cabin seems sadly lacking in one."

"Tony?" Margot exclaimed. "Is he still here?"

Captain Linstrom laughed. "I quite understand you. He seems very worried, quite over-eager to return to Mars. We shall be passing there one day, of course, though not I fear for some time. However, time is no longer a consideration to you. I believe you are to spend the entire voyage in sleep. But a very pleasantly colored sleep nonetheless." He smiled roguishly at Margot.

As he reached the door Clifford managed to gasp out: "Where are we? For heaven's sake, call the police!"

Captain Linstrom paused in surprise. "But surely you know, Mr. Gorrell?" He strode to the window and flung back the curtains. In place of the large square casement were three small portholes. Outside a blaze of incandescent light flashed by, a rush of stars and nebulae.

Captain Linstrom gestured theatrically. "This is the *Dream of Osiris*, under charter to Terminal Tours, three hours out from Zenith City on the non-stop run. May I wish you sweet dreams!"

THE END

(Continued from page 6)

et Society. He is the author of *The Milky Way Galaxy*, a non-technical description of recent developments in astrophysics; and of many articles in the fields of rocketry, astronomy, astronautics, magneto-hydrodynamics, and—extra-terrestrial life.

If any of you feel inclined to argue with Bova about the conclusions he comes to in this present series, you might be better advised to do so in our lettercols than in person: Ben is a top-flight fencer.

EXTRA-TERRESTRIAL LIFE:

An Astronomer's Theory

By BEN BOVA

The readers of science fiction live in two worlds. On the one hand we accept with a willing suspension of disbelief the existence of a multitude of life-forms in the Universe. On the other—that is, when we have finished reading science fiction—we wonder whether there is life anywhere else but on this planet.

The editors of AMAZING have asked expert Ben Bova to explore the subject of extra-terrestrial life so that all of us can consider it intelligently as well as emotionally. Mr. Bova writes, in this first article of a series of four, about the nature of life on Earth. His subsequent articles will discuss the scientific possibilities of life on other planets; the inevitability of life in the Solar System; and the probabilities of life elsewhere in the Universe.

THE well-endowed blonde registers stark terror, screams and tries to get away. Towering over her, the Giant Lobster quivers his antennae menacingly. His malevolent claws reach out for the blonde. She shrieks again and runs, only to stumble and fall. The Giant Lobster rips off most of her clothing with one monstrous claw, and with the other . . .

That's the way Hollywood views extraterrestrial life. Just like home, only bigger. But the thing that makes science fiction (and science fact) interesting is

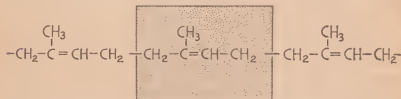
that it must be internally consistent. To blow up a two-pound lobster into a monster weighing several tons sounds like a shaky business, at best.

But let's not just sit back and criticize. Why not build a giant lobster? Exploring this should help us to see the problems connected with envisioning life on other worlds. To make certain that our exercise is meaningful, and not merely wasted rainbow-chasing, we'll be guided always by the known laws of physics, chemistry, biology, and astronomy.

FIRST, comes the matter of size. Arbitrarily, we'll take a two-pound lobster and multiply his size by a factor of 25. Since weight depends on volume, and volume varies with the cube of size, our giant weighs $2 \times 25^3 = 30,000$ pounds—15 tons. That should be big enough to frighten any blonde in Hollywood. Just to be nasty, we'll have our extra-terrestrial crustacean breathe fluorine. This means he'll have to car-

is a molecule called deoxyribonucleic acid (DNA). All life on Earth, from algae to whales, is based on DNA. The most fundamental part of a living cell, the genes, are DNA. The smallest living creatures, the viruses, are little more than single molecules of DNA.

You probably know that animal bodies—our own included—are built of proteins. Various types of proteins also regulate all



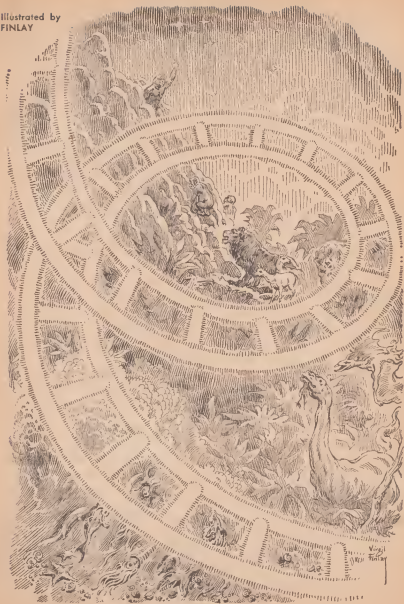
Part of an organic carbon-chain molecule (gutta percha, a rubber-like substance). The shaded area shows a single isoprene unit. These units link together to form the long-chain molecule. Note that each carbon atom has four valence "links," and combines either with hydrogen atoms or other carbons in variations that always total four.

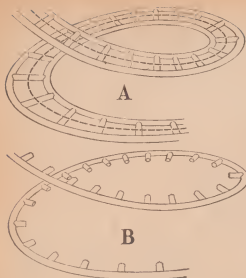
ry some sort of breathing apparatus, because our air would be poisonous to him. We can hardly expect a 15-ton fluorine-breathing lobster to have a body chemistry remotely similar to our own. Or can we?

Just what is this thing called life on Earth? What's the difference between a living lump of protoplasm and a non-living heap of chemicals? What are the essential requirements of life? And, most important, how did life get started here in the first place? The chemical basis of life

our bodily chemical processes; in this role they're known as enzymes. Proteins are composed of many different combinations of amino acids. The DNA molecule, with the aid of ribonucleic acid (RNA), can "manufacture" amino acid and proteins. DNA can reproduce itself *from simpler surrounding material*. This is the fundamental of life. Auto-reproduction. The ability to make simpler chemicals and build them into a DNA molecule. No other atom or molecule can do this. No other atom or molecule is alive.

Illustrated by
FINLAY





Autoreproduction of DNA molecule:

(A) shows a complete DNA molecule, consisting of a double spiral with interconnecting bridges.

In (B) the two spirals have separated by splitting the bridges in half. Each half bridge will connect only with materials similar to those it was connected to in the original molecule. Thus two molecules exactly the same as (A) are produced. The total mass of an entire DNA molecule is equivalent to six million hydrogen atoms!

WHAT'S so different about the DNA molecule? First, it's the giant of the molecular world. Inorganic molecules may contain a half-dozen or so atoms. Organic molecules (rubber, for instance) are composed of thousands of atoms, arranged in a long, carbon-based chain. But the DNA molecule dwarfs them all. It is composed of literally millions of atoms, arranged in a complex double-coiled structure. Like the organic (but un-alive) molecules, DNA is based on carbon chains—that marvelous ability of carbon atoms to link up into long, complex structures. In DNA, atoms of oxygen, nitrogen, hydrogen and many other elements combine with carbon.

DNA is built on a double-helical pattern: like two spiral staircases intertwining, with connecting spans bridging between them. When DNA reproduces, the two spirals separate; the interconnecting bridges break in half. The open ends of each half-bridge are an open invitation to nearby chemicals to join up. But the bridges will only accept very specific partners; they will connect only with the exact type of molecular structure that they were linked to in the original molecule! Thus each half-bridge seeks out a partner exactly like the one it originally had. These new partners, in turn, are forced to link together as they join the DNA half-molecule. When the in-

terconnections are completed, each half of the original DNA molecule has reproduced its "missing" half. There are two double-helix DNA molecules, ready for business.

The question now arises: Where did DNA come from? We have seen that anything less than DNA cannot auto-reproduce. A single DNA molecule can, in theory, explain the origin of all the life on Earth. But we must be able to explain the origin of that first DNA molecule, or else all we can say about life on Earth—or elsewhere—is that it arose "somehow." We must view Earth as it existed 2.5 billion years ago . . . just before life began.

THE planet had a solid crust and large oceans. But the land was barren rock, lifeless, a bleak gray landscape racked by wind and rain, without a hint of color. The atmosphere of the young Earth was ammonia, methane and carbon dioxide: poisonous to us. Only the friendly sea would we recognize, and even that was not exactly the same. The oceans were less salty then, since 2.5 billions years of constant erosion of the lands by rain and wind have added considerable salt to our modern seas. But, then as now, the oceans were the predominant feature of the terrestrial scene. The oceans con-

tained a great number of dissolved chemicals in their waters. There were ions of sodium chloride, potassium, calcium, magnesium and several other minerals, plus considerable amounts of ammonia, carbon dioxide and other gasses dissolved from the atmosphere.

That list of ingredients excites the biochemist. It is almost exactly the same combination of chemicals contained in living cells. In human cells. Our bodies today carry replicas of the ancient seas of Earth. Thus, while the oceans of 2.5 billion years ago contained no living creature, they did hold all the necessary ingredients. What happened seems obvious. The chemicals in the oceans arranged themselves in such a way that they formed a DNA molecule.

Of course, DNA is a fantastically complex molecule, but in 2.5 billion years, the simple laws of statistics should be enough to explain the formation of at least one DNA. Shouldn't they?

NO. It's not that easy. DNA is composed of millions of atoms. If the atoms are connected at random, only according to the laws of statistics, the chances of reaching the exact combination of DNA (so my mathematically-inclined friends tell me) are $10^{5,000,000}$ to 1! That's a 1 with five million zeroes behind

it! If you could write nine zeros per second, it would take 24 hours to write down that number. There hasn't been enough time yet in the whole universe to expect the proper combination to arise by blind chance. Well, then, perhaps it was an accident, a lucky throw of the dice that gave us a DNA molecule long before the laws of statistics would otherwise have permitted it. It's a tempting speculation. But if we agree that life on Earth is a fortunate freak occurrence, what are the chances of life elsewhere? How many such freak occurrences can we expect in one Solar System? Or even in one galaxy?

But look again. Remember how the DNA helix splits and forms two new molecules of itself from simpler surrounding chemicals? Those DNA half-bridges don't combine "at random". They're very specific about their partners. To some extent, all atoms are choosy about how they combine. (Anyone who has suffered through memorizing valences in high-school chemistry should see this point with painful clarity.) We can picture, then, a period of "chemical evolution" in the primeval seas that preceded the advent of the first living molecule. Over countless millenia, atoms combined to form constantly-larger, constantly-more complex combinations. Gradually, long-chain carbon molecules arose.

Then the ring structures that biochemists call porphyrins, purines and pyrimidines. The seas were becoming what has been described as an "organic soup." Amino acids were formed, and then proteins. Finally the nucleic acids—DNA and RNA—appeared. The inevitable happened. A DNA molecule met and joined a protein, forming the first nucleo-protein molecule. From then on, DNA could reproduce nucleoproteins. Life began on planet Earth. Chemical evolution gave way to biological evolution.

All that was needed to produce this chain of events was time and energy. Time there was in plenty. And the energy that impelled these once-inert chemicals to combine continuously was also plentiful. There was radioactivity from the Earth's mantle, stronger then than now. There was lightning lashing down on the seas from the ammonia, methane, carbon dioxide atmosphere. And, most important of all, there was strong ultraviolet light of the Sun, unfiltered by Earth's primitive atmosphere. The rest is history. Or rather, paleontology. The first living creatures no doubt derived their energy from the not-yet-living chemical that abounded in the "organic soup." This supply soon dwindled to the vanishing point. But life passed its first crisis successfully. Chlorophyll, a porphyrin mole-

cule, was made use of. Living creatures learned to manufacture their own food from inert chemicals and sunlight. Thus, "animals"—creatures that cannot make their own food—actually pre-date the first plant life.

CHLOROPHYLLIC plants in the sea changed the face of our whole planet. They breathed in carbon dioxide and exhaled oxygen, which went into the atmosphere. The oxygen converted the existing ammonia/methane combination into our familiar nitrogen/oxygen air. Ammonia and oxygen combined to form water and free nitrogen:



Methane and oxygen reacted to make carbon dioxide and water: The water joined the oceans,



the plants breathed the carbon dioxide, and more and more oxygen was poured into the atmosphere to join the newly-freed nitrogen. Finally, our type of animal life appeared to consume oxygen and produce carbon dioxide. Thus the chain of life became a full cycle: plant and animal formed an atmospheric symbiosis.

All this presents a pretty picture indeed. But a theory is still only so much hopeful guessing until it's verified—in whole or part—by experiment. This theory has been partially verified. In

1952, at the University of Chicago, biochemist Sidney Miller mixed some of the chemicals of the primeval sea (water, ammonia, methane, etc.) and passed them through an electrical discharge that stimulated the ultra-violet radiation of the Sun. He obtained two simple types of amino acids, plus indications of at least two more complicated ones. Thus there seems to be no good reason why we can't theorize that life arose on Earth from the "chemical evolution" of 2.5 billion years ago. Furthermore, if we can find Earth-like conditions anywhere else in the universe, we can postulate the existence of life there.

BUT most of the universe is decidedly *un-like* Earth. What about life under non-terrestrial conditions? In particular, what about our giant lobster, whom we left hanging over the helpless blonde? We can use our knowledge of life on Earth and expand it in an effort to find the universal requirements for life . . . the requirements that hold true no matter what environment we care to discuss.

1—*Life needs a building block.* On Earth this is carbon, which has the vital ability to link up in chains and coils and permit the construction of complex molecules. Other elements will do this: silicon can form chains; under

extreme conditions, phosphorus, boron, and germanium will all make chains. But of them all, carbon is the most active chemically. Our giant lobster, therefore, will be based on carbon-chain molecules.

2—*Life requires a solvent*—some medium in which all the necessary ingredients can be brought together, and in which chemical reactions can proceed. Earth's solvent is water—liquid water. Under un-Earthly conditions we might expect to find liquid ammonia or methane, even liquid hydrogen sulfide or carbon disulfide as passable solvents. For our fluorine-breathing lobster, we can imagine hydrogen fluoride for a solvent. That is, we'll simply replace the oxygen in water and substitute fluorine.

3—*Life needs some form of energy-exchange reaction, and a healthy supply of the reacting substance.* We Earthlings use a heat-producing biochemical reaction involving hydrogen and oxygen. This works nicely on a planet practically brimful of liquid water. But if we go much beyond Earth, water becomes either nonexistent or frozen, and different energy-exchange processes must be found. You can probably guess that our giant lobster's energy reaction will be a hydrogen-fluorine system, since we've already substituted hydro-

gen fluoride for water. This is a dandy reaction, as far as energy is concerned, but it does pose certain problems. (Incidentally, instead of fluorine, we might have substituted for oxygen just as easily with chlorine, bromine or even sulfur. We would have to juggle the temperature of the lobster's home planet. Sulfur, for instance, won't become gaseous even at the 700° F temperature of Mercury's hot side; but we *could* imagine a hydrogen sulfide atmosphere at that temperature, and seas of liquid sulfur—a cozy warm planet indeed!)

The main drawback of these elements is that they simply don't produce much energy. Life is a strenuous business, and demands a lot of energy. But the hydrogen-chlorine reaction yields only one-third of the energy of the hydrogen-oxygen system. Bromine gives one-eighth and sulfur a scant one-tenth. Energy-poor reactions! But when hydrogen and fluorine get together, the reaction yields 1.5 times the energy of the hydrogen-oxygen system. More than enough to sustain any lobster, giant or otherwise.

HOWEVER, there's a catch. Two of them, in fact.

First, none of these elements is very abundant, whereas oxygen is plentiful in the universe (as are hydrogen, carbon and

nitrogen). For instance, for every 43 sulfur atoms in the universe, there are 1400 oxygen atoms (and 3.5 million hydrogen atoms). For every *one* atom of fluorine, there are 1400 oxygen atoms. This makes the chances of a fluorine-breather somewhat scanty. But not impossible. On the other hand, it improves our chances of someday meeting a fellow oxygen-breather.

The second catch involves the energy ratio of the hydrogen-fluorine system. While this reaction yields a nice helping of energy, it also requires a lot of energy to break up hydrogen fluoride into its two constituent elements. On Earth, chlorophyllic plants use the red light of the Sun to break water into hydrogen and oxygen. That's the starting point of our type of life. But red light isn't energetic enough to split hydrogen fluoride. Ultraviolet light is needed. If we towed the lobster's planet close enough to a Sun-like star to get the necessary dosage of UV, the temperature of the planet would go up high enough to boil away the fluorine atmosphere. (A fluorine atmosphere would require a planetary temperature range somewhat cooler than Mars' yet warmer than Jupiter's.)

Our only alternative is to find a star that emits much more UV than Sol does. There are many such stars: blue giants like Ri-

gel, Spica, Regulus and Achernar. We can place a planet far enough from, say, Regulus to remain cool enough to retain its fluorine atmosphere and still expect it to receive a strong dose of UV. But—damnation!—a fluorine atmosphere would probably screen out almost all the ultraviolet light it receives. Very little would reach the planet's surface. Let's be bold, though, and assume that the surface receives enough UV to allow some sort of plant life to split the hydrogen fluoride for us—or, rather, for our lobster friends.

THE planet itself, we've seen, would be cooler than Mars yet warmer than Jupiter: a temperature averaging about -50°F . Its comparatively low temperature indicates that it could be a fairly large planet, approaching the size of Jupiter (we'll see why later on). Also, it would have to be rather large to contain a goodly amount of an element as rare as fluorine. So we can picture a planet approximately the size of Neptune. Its surface gravity would be about 1.25 Earth's, so our 15-ton lobster would weigh 18.75 tons at home.

Would he really look like a lobster? Could eight spidery legs hold him up? Would a thin external skeleton keep his body from being squashed flat by its own weight? The answers are

<u>Element</u>	<u>Universe</u>	<u>Earth</u>	<u>Crust</u>
H (Hydrogen)	3.5×10^8	.....	1,400
He (Helium)	1.4×10^7	.....	.....
C (Carbon)	38,000	.....	27
N (Nitrogen)	83,000	.....	3
O (Oxygen)	140,000	38,000	29,500
Ne (Neon)	160,000	.....	.....
Na (Sodium)	490	130	1,250
Mg (Magnesium)	11,000	15,000	870-8
Al (Aluminum)	870	350	3,050
Si (Silicon)	10,000	10,000	10,000
S (Sulfur)	4,300	1,800	.....
K (Potassium)	66	40	670
Ca (Calcium)	690	330	920
Ti (Titanium)	26	18	133
Fe (Iron)	5,400	13,500	910
Ni (Nickel)	380	1,000	.....

The abundances of the elements in the universe at large, in the Earth as a whole, and in the Earth's crust. The number of silicon atoms is arbitrarily set at 10,000 in all cases, and the values for the other elements computed accordingly. Note that the universe is almost entirely hydrogen and helium, with all the other elements forming a small percentage of "impurity," while the Earth is mostly "impurity." (After Brian Mason)

no, no, and no. Weight, you remember, increases with the *cube* of size. The strength of a supporting structure (legs or skeleton) depends on its cross-section, and therefore increases only with the *square* of size. The lobster's supporting structures must grow faster and bigger than his overall size. His thin exoskeleton would have to take on the thickness of a bunker wall. More than likely, he'd forego a shell completely and develop an internal skeleton. It works better, particularly with large sizes. His

legs would have to grow to the thickness of a man's torso. And eight of them would probably just get in each other's way; four would be easier to manage, perhaps two would be best of all. The same applies for his claws. Enlarging them by a factor of 25 would make them impossibly clumsy to wield; our giant would need muscles the size of his own body just to lift them. And as for dexterity, our poor burdened-down monster wouldn't be able to catch an octogenarian, let alone a healthy young blonde.

Perhaps he'd be better off with a single grasping mandible. To make things simpler (an important aspect of life) we'll locate it centrally, in his head. His broad finny tail—good for swimming—would tend to become long and thick if he lives on dry land.

IF you think our giant lobster now looks more like *Tyrannosaurus Rex* than anything else, you're perfectly right. Given nearly five billion years in which to experiment and develop, life on Earth could come up with nothing more powerful, nor more monstrous than the Tyrant Lizard. He was the perfect predator. Chances are that even his 200-million-year-old skeleton would scare the wits out of our blonde. So we have a fluorine-breathing *Tyrannosaurus*. Is he made of nucleoprotein and DNA? Yes and no.

Certainly he needs a basic molecular structure that can do all the things that DNA and proteins do. But our type of protoplasm wouldn't last five minutes in a corrosive fluorine atmosphere. Our molecules are essentially hydrocarbons; our monster's would have to be fluorocar-

bons—combinations of fluorine and carbon. Any sane chemist will throw up his hands and pronounce a life-chemistry based on fluorocarbons is impossible. But he's considering the chemistry he learned on Earth. On a Neptune-sized planet, at temperatures that get down to nearly -100°F , with a fluorine atmosphere—who can say? (If you're wondering about the ability of fluorocarbons to withstand corrosive environments—well, one variety of them, called Teflon, is used on missile nose cones to withstand the incandescent heat of re-entry.)

So much for our so-called giant lobster. The blonde? Since we're being sensible about things, our monster has no interest in her. She's too small for a decent meal, and too revolting to a monster's sense of beauty. Besides, she reeks of oxygen.

* * *

EDITOR'S NOTE: That just goes to show you how contrary life can be sometimes. Our next step, next issue, will be to start hunting through the Solar System for real—not manufactured—extra-terrestrials.

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The Saintly Heresy of **CLIFFORD D. SIMAK**

By **SAM MOSKOWITZ**

DURING the 17th Annual World Science Fiction Convention held in Detroit in September, 1959, the "Hugo" award for the best novelet of the previous year was presented to Clifford D. Simak for *The Big Front Yard* (ASTOUNDING, October, 1958). Simak thus became the first science fiction author in history to receive both of the major awards possible in the fantasy world. The previous one had been the 1952 International Fantasy Award for the best novel of science fiction or fantasy published during 1952, *City*.

Had this point been underscored, no one would have been surprised. *The Big Front Yard* was but one of dozens of superbly wrought tales, supreme in a craftsmanship that endowed ordinary folk from humble surroundings with special qualities to cope with bizarre aberrations of space and time, as well as



Photo by Bonham Cross, Minneapolis Star

with technologies that would have baffled an Einstein.

In *The Big Front Yard*, Hiram Taine, repair man extraordinary and antique dealer, in company with a handyman misfit who claims to be able to talk with animals, drives a hard bargain with the inhabitants of another world, who have warped his front yard through another dimension so that it faces out upon an alien planet in an unguessable corner of the cosmos.

He was typical of scores of oth-

er Simak "heroes", who, whether dirt farmers, near idiots or love-struck robots, had a function, a reason for being in the universe that could fathom the unknowable and defeat the omnipotent.

Simak manages to accentuate the positive in the personalities of his diverse group of unlikely supermen. He rarely dwells on the morbid, the horrifying or the decadent. In his worlds and in the lives of his characters there is room for hope, for kindness, for decency and for a morality that would be more obvious if the reader were not spellbound by the artistry of the storytelling. Regardless of their stations, his characters are more saints than sinners. Good predominates over evil and optimism over despair.

Simak's greatest love and affection is reserved for the farmer. Directly and indirectly, more farmers pass through the science fiction of Clifford Simak than through the works of any author outside COUNTRY GENTLEMAN. Born on the farm of his grandfather Edward Wiseman on Aug. 3rd, 1904 in Millville, Wisconsin, Simak never lost the sweet memory of rural life.

CLIFFORD'S father, John L. Simak, was born in Czechoslovakia near Prague. Son of a butcher, though related to noblemen who had seen better days,

he came to work as a hired hand on the Wiseman farm. There he met and married Margaret Wiseman. A year later he bought some nearby acreage, used lumber from the land to build a log house, and gradually cleared a farm for himself.

Every fact seems to indicate that Clifford D. Simak was deprived by his family of all the elements needed to weave the tangled web of neuroses which are the birthright and plot salvation of many an author. "If you have read Bob Ruark's *The Old Man and the Boy*—well, that was my boyhood, too," Simak recalls. "We hunted and fished, we ran coons at night, we had a long string of noble squirrel and coon dogs. I sometimes think that despite the fact my boyhood spanned part of the first and second decades of the twentieth century that I actually lived in what amounted to the tail end of the pioneer days. I swam in the big hole in the creek, I rode toboggans down long hills, I went barefoot in the summer, I got out of bed at four o'clock in the morning during summer vacations to do the morning chores. For four years I rode a horse to high school—the orneriest old grey mare you ever saw, and yet I loved her and she, in her fashion, loved me. Which didn't mean she wouldn't kick me if she had a chance. And before high school,

I walked a mile and a half to a country school (one of those schools where the teacher taught everything from first grade through eighth)."

Young Clifford had to toe the line when there was work to be done, but was permitted all the romping he wanted when there wasn't. Finances were generally severe; but despite problems the family, which included a younger brother, was closely knit and devoted.

Two simple factors set his mind towards journalism and writing. He recalls vividly watching his mother read a newspaper when he was about five.

"Does the newspaper print all the news from all over the world?" he asked.

"It does," she replied.

"Does it print the truth?"

"It does."

"From that moment on I knew I wanted to be a newspaperman," Simak affirms. "And don't you, dammit, snicker."

A SECOND contributing factor was the old family reading circle so popular years ago. The family would gather 'round while the mother or father read a book or newspaper. A magic and wonderful world came into view from those readings.

Though he got along well with the rest of the boys, Simak did not care for athletics. Scholasti-

cally he did somewhat better, standing second in his high school graduating class of Patch Grove, Wisconsin. A series of diverse jobs followed high school, pivoting on a two year's teacher training course which found him an instructor for the next three years. An attempt to work his way through the University of Wisconsin failed and led to his first newspaper job on the IRON RIVER REPORTER, Iron River, Michigan.

During this period, several other events occurred which were to shape his entire life. An avid reader of Jules Verne, H. G. Wells and Edgar Rice Burroughs, he found himself really hooked when he picked up AMAZING STORIES in 1927 and became a regular reader.

A chance meeting with Agnes Kuchenberg at the Cassville, Wisconsin moving picture, while Simak was teaching, blossomed into romance and they were married on April 13, 1929. Only weeks earlier Simak had accepted the staff position on the IRON RIVER REPORTER.

Like any newspaperman, he wanted to write; because he liked science fiction he decided that was the natural medium to dabble in. His first effort, *The Cubes of Ganymede* was completed and shipped to AMAZING STORIES in early 1931. Its editor, T. O'Connor Sloane, then approaching oc-

togenarian status, didn't believe in rushing things. He never bothered to inform Simak whether he was going to use the story, but two years later the April, 1933, issue of SCIENCE FICTION DIGEST, one of the earliest fan magazines, listed *Cubes of Ganymede* as one of the "Stories Accepted by AMAZING STORIES for Publication." Finally, in 1935, Sloane returned the story as a bit dated in view of the changing trends in science fiction. Simak never quite recovered from the incident and the manuscript remains unpublished.

The next attempt was more rewarding. *World of the Red Sun* found a home with Hugo Gernsback's WONDER STORIES and appeared in the December, 1931, issue of that magazine. The story displayed a clear, stark writing technique. Dealing with time travel, the adventurers into the future encounter a gigantic glass-encased brain which holds the degenerating remnants of mankind in thrall. The men from the "present" destroy it by employing the psychological weapon of derision. Beyond its obvious debt to H. G. Wells in its basic theme and the concept of the ultimate degeneration of man as a species, *World of The Red Sun* was fundamentally a second generation science fiction story, whose framework and filling were derived from the products of the science fiction magazines. It was

the work of a man steeped in the still-fresh lore of the science fiction world, who assumed that the reader was familiar enough with the medium to accept on faith imaginative notions that were destined to become literary dogma.

World of the Red Sun was followed quickly by *Mutiny on Mercury* in WONDER STORIES, March, 1932, a minor action story of the revolt of the Martian and Selenite workers on Mercury and their eventual defeat at the hands of an earth man wielding a sword dating from the Napoleonic wars.

THOUGH badly over-written and melodramatic, *The Voice in the Void* which appeared about the same time in the Spring, 1923, WONDER STORIES QUARTERLY, showed considerable power in handling, involving the desecration of a sacred Martian tomb, containing the bones of the "Messiah". The fact that the Martian tombs are constructed in the shape of a pyramid provide a clue to the fact that the sanctified bones are those of an Earthman. As in *World of the Red Sun*, Simak's obvious familiarity with hundreds of past science fiction stories enabled him to repeatedly avoid trite situations and close on a note of originality.

Simak experimented with sending his next story, *Hellhounds of the Cosmos* to ASTOUNDING STO-

RIES. It was accepted and published in the June, 1932, issue. *Hellhounds of the Cosmos* told of a "black horror" out of the fourth dimension. To counter it, a scientist sends 99 men into the parallel world where they occupy a single grotesque body. They succeed in terminating the invasion at the price of remaining the rest of their lives in the alien place. *Hellhounds of the Cosmos* is worth noting because it is the first story to betray a tendency towards mysticism that frequently spills Simak's science fiction over an ill-defined perimeter into the world of fantasy.

Simak's first cycle of magazine publication ended with *The Asteroid of Gold* in the November, 1932, WONDER STORIES. A space pirate who takes the gold found on an asteroid from two explorers and leaves them there to die, is doomed to spend the rest of his life invalided as a result of a broken back at the hands of his victims. Here, as in *Hellhounds of the Cosmos*, Simak reveals a sharp line of demarcation between black and white and brings about sure, grim retribution for the evildoers.

THE temporary suspension of ASTOUNDING STORIES early in 1933 left Simak without a paying market. Both WONDER STORIES and AMAZING STORIES, the only other magazines, were skipping

months and it seemed likely that any issue might be their last.

Simak wrote one more piece of science fiction, *The Creator*, literally for love, since, as far as he was concerned, there was no market. "Had there been a market," he asserts, "the story would never have been written for I would have slanted for that market." In that story, a time machine carries two earthmen to the laboratory of an intelligent "cone of light" that created the universe as an experiment. Three other outre-worldly beings, by coincidence, also arrive on the scene. Together they act to prevent "The Creator" from destroying the universe.

Shortly upon completing *The Creator*, Simak received from a science fiction fan, William H. Crawford, notification of the publication of a "literary" science fiction magazine which solicited stories offering a lifetime subscription as payment. Simak let Crawford have the story out of sheer admiration for any man with guts enough to try a new science fiction magazine. *The Creator*, as published in the March-April, 1935, MARVEL TALES was probably read by only a few hundred readers; yet, by letter, by word of mouth and through comments in fan magazines the message got around that Clifford D. Simak had written a "classic," a daring story that defied the ta-

boos of newsstand magazines. While there are certainly crudities in *The Creator*, many polished modern writers would gladly exchange some of their stylistic sheen for the enthusiasm, excitement and mysterious wonder imparted in that tale.

(To bring the story to a larger audience, FANTASTIC magazine reprinted it in July, 1961.)

SIMAK still felt the itch to write and tried a few things outside the science fiction field, but they came off too poorly to submit. Despite the bitter economic pall of the depression years, he managed to keep working. His reporter job on the IRON RIVER REPORTER grew into the editorship. He left that position in August, 1932, to assume the top spot on the SPENCER REPORTER in Spencer, Iowa. In July, 1934, he shifted again to the editorship of the DICKINSON PRESS, Dickinson, North Dakota.

The purchase of the SPENCER REPORTER by the McGaffin Newspaper Co. of Kansas, a much larger organization, offered a better long-range future and he returned there in April, 1935, in time to help convert the paper from a semi-weekly to a daily. Pleased with his work, the company made him an editorial trouble shooter, transferring him to Excelsior Springs, Mo., where he worked on the EXCELSIOR STAND-

ARD; then to the editorship of their Worthington, Minn. paper, and finally to the BRAINERD DISPATCH in Brainerd, Minn.

Though his writing activity had ceased, Simak continued intermittent reading of science fiction, without too much enthusiasm, until late in 1937 when he learned that John W. Campbell, Jr. had been named editor of ASTOUNDING STORIES.

"I can write for Campbell," he told his wife. "He won't be satisfied with the kind of stuff that is being written. He'll want something new." There is the possibility, he now admits, that if Campbell had not been named editor of ASTOUNDING STORIES, he might never have written science fiction again.

His first attempt was *Rule 18*, a novelet of the annual football rivalry between Mars and Earth and the search back in time to assemble a team of all-time pigskin greats to defeat the potent Martian eleven. This approach was off-beat for science fiction at the time, since it utilized the immense potentials of scientific invention to influence a sports event, instead of saving the world from disaster.

Campbell was so enthusiastic about the story that he plugged it as "One of the year's best novellets," prior to its appearance in the July, 1938, issue. *Rule 18*, while popular, rated only fourth

in the issue in the readers' estimate. Nevertheless, Campbell continued to promote Simak's fiction. He gave prominent advance notice to Simak's *Hunger Death* in the October issue, dealing with the problems of Iowa farmers resettled on Venus. This story is important, inasmuch as it finds Simak dealing with the type of people he knows. Characters favored second only to farmers in a Simak tale are heroic newspaper reporters.

Reunion on Ganymede, Simak's next, was featured on the cover of the Nov., 1938, number. Dealing with a planned anniversary get-together of veterans of a war between Earth and Mars, the story finds two members of opposing forces thrown into a situation where they reconcile their grievances. It was not an outstanding effort, but it led the issue in reader approbation.

The themes of the three stories, a football game of the future, Iowa farmers on Venus and an old war veteran going to a reunion on Ganymede represented a major move in the direction of naturalness in science fiction. While Simak may not have completely come off in his presentations he was exploring a gambit that would eventually produce pay dirt.

The Loot of Time, published in **THRILLING WONDER STORIES** for

December, 1938, was more in the traditional vein, stressing the sentimental attachment that springs up between a group of time travelers, actors in a power play in time, and a Neanderthal man who inadvertently gets involved with the sciences of his future.

In giving readers a new type of story should he dispense with the old? Campbell felt that while change was inevitable, there was still room for what he called the "power" story and what has been termed by others as the "super science" or "thought variant" tale; stories along the lines of E. E. Smith, where entire universes weigh in the balance, where space and time are merely tools in the hands of advanced science.

At his request, Simak wrote *Cosmic Engineers*, a novel which ran in three parts beginning in the February, 1939, issue of **ASTOUNDING**. *Cosmic Engineers* employed ideas of truly epic proportions including a civilization of robots who were guardians of the universe, a girl scientist in suspended animation for a thousand years (but improving her mind all the time), another universe in collision with ours, a council of great intellects of many worlds and dimensions to cope with the problem, and thrilling trips through time; a novel with enough thrills for five sequels.

Nevertheless, Simak personally considered the effort a failure. He had hoped to blend some of the ground-roots feel of ordinary people into the work but found that "you had to be grandiose in spite of yourself."

READ uncritically, *Cosmic Engineers* is a much more exciting reading experience than the author would lead one to believe. It does not bear close examination, however, since there are too many loose ends; but it is reminiscent in portions of *The Creator*, even possessing a God-like manipulator who is senile and insane. This same "God" is the collective absorption of an entire race into a single intelligence, bearing some resemblance to Olaf Stapledon's notion of the "Cosmic Mind."

Following *Cosmic Engineers* Simak decided to embark on a new project. A fictional picture of each of the planets as science knows them today. The first in this series was *Hermit of Mars* (ASTOUNDING, June 1939), a cover story involving the efforts of an earth scientist to transform his flesh and blood body into another of pure force, such as that possessed by the Martians.

Writing ceased for the next nine months. Simak, feeling that he was moribund with the McGuffin Company, resigned from that organization and went to

work on the copy desk of the MINNEAPOLIS STAR. As far as the newspaper career was concerned, he had found his niche. He soon would become chief of the copy desk.

HIS first work after the shift of positions was also one of his most successful. *Rim of the Deep* in ASTOUNDING SCIENCE FICTION, May, 1940, was one of the earliest of those rare stories dealing with the exploitation of the sea bottom and the day when population pressures would force men to live beneath the waves. The novelty of the notion was not lost on readers but it has been infrequently picked up by other writers, the most notable subsequent works in this vein being *Fury*, by Henry Kuttner and *The Deep Range*, by Arthur C. Clarke.

Clerical Error which followed in August, 1940, ASTOUNDING was intended to be a second in his "planets" series, dealing dramatically with conditions on Jupiter; *Masquerade* (ASTOUNDING, March, 1941) involved a doctor who discovered crystals of immortality on Mercury. With *Tools* (ASTOUNDING, July, 1942) concerning a radioactive gaseous life form on Venus, he quit the series as a bad idea.

There were other stories of solid competence during this period, but the sad part about a man who is gradually becoming a lit-

erary craftsman is, that if he is really good, people will not be aware of his skill. This was true of Simak. *Hunch* in the July, 1943, ASTOUNDING SCIENCE-FICTION early displayed his much-imitated technique of permitting the lead character to think to himself for the readers' benefit. *Hunch* brings into being "Sanctuary", an organization that helps rehabilitate or offer peace of mind to those who have mentally broken under the pressures of advanced civilization, offering to them a haven when all else fails.

IN the "City" series which followed and established Simak's reputation, it was a newspaperman, armed with the tools of literary artistry and well versed in the problems of urban living that took the very obvious theme of decentralization of cities and focussed the spotlight on the impact of this trend on the individual. It had been many years since David H. Keller, M.D., had dealt with the impact of current trends on the sociological and economic wellbeing of the average man. Looking back from the vantage of the present, the consensus rates *City* (ASTOUNDING SCIENCE FICTION, May, 1944) as a "gem." From the immediacy of 1944 its theme struck an unfamiliar note and opinion was divided.

IT was the second story in the series, *Huddling Place* (ASTOUNDING, July, 1944), that solidified a positive reaction to what Simak was trying to do. It displayed a decitized planet where personal contact had become increasingly abhorrent, culminating in the crushing horror of a man's realization that he is unable to leave his home, even to save the life of a good friend, and with it a new concept of philosophy that would advance mankind 200,000 years in a single stroke. *Huddling Place* is a true masterpiece of science fiction, in or out of the continuity of the series.

Nathaniel, the talking dog of *Census* (ASTOUNDING, Sept., 1944), was the name of Simak's own pet scottie. When the "City" series was collected in book form by Gnome Press in 1952, the volume was dedicated to Nathaniel. From his participation also sprang the idea of connecting the tales as legends told by intelligent dogs of the future, long after man had disappeared from the planet. In this tale, too, are introduced the mutants who introduce technology to the ants.

Desertion (ASTOUNDING SCIENCE FICTION, Nov. 1944) was written before any of the other stories and was not originally intended to be one of the series. It was included as an afterthought when the book was assembled, to

show the beginning of man's transference from human to Jovian bodies, a natural prelude to *Paradise* (ASTOUNDING SCIENCE FICTION, June, 1946), where the political decision as to whether the bulk of the human race should migrate to Jupiter and convert to Jovian form is made.

In *Hobbies* (ASTOUNDING SCIENCE FICTION, Nov., 1946), the decision is made to give the dogs and the robots an opportunity to build a future for themselves without physical or psychological interference from the few remaining men. The Cobblies, strange creatures from another dimension are here introduced.

The near primitive remnants of man show the robots how to dispose of the threat posed by the Cobblies in *Aesop*, Dec., 1947, a tale that teeters perilously close to fantasy and mysticism since the Cobblies allegorically assume the role of the ghosts and goblins (imaginary fears) that once plagued mankind.

The point of the entire series was delicately brought home in *Trouble With Ants* published in FANTASTIC ADVENTURES for Jan., 1951, when Jenkins, the robot guardian of the canine civilization, awakens a man from suspended animation to learn how to stop the ants, whose civilization threatens to end the dogs' reign of the planet. A simple way to stop the ants, offered by the man,

is rejected because it will mean killing. There has been no killing, even of fleas, for five thousand years and the robots and dogs prefer to be dispossessed, rather than revive it as a means of settling problems.

"The series was written in a revulsion against mass killing and as a protest against war," states Simak. "The series was also written as a sort of wish fulfillment. It was the creation of a world I thought there ought to be. It was filled with the gentleness and the kindness and the courage that I thought were needed in the world. And it was nostalgic because I was nostalgic for the old world we had lost and the world that would never be again—the world that had been wiped out on that day that a man with an umbrella came back to London and told the people there would be a thousand years of peace. I made the dogs and robots the kind of people I would like to live with. And the vital point is this: That they must be dogs or robots, because people were not that kind of folks."

FROM 1942 to 1945, science fiction was but a small part of Simak's fictional production. A larger portion of his spare-time efforts went into air war and western stories, particularly for Leo Margulies and Thrilling Publications. The tales were so

formularized that Simak simply couldn't continue writing them and live with himself, so he dropped their production and turned entirely to science-fiction.

Eighteen years after his marriage, a first child, Scott, was born in 1947 and a second, Shelley, in 1951. He was promoted to News Editor of the MINNEAPOLIS STAR in 1949. In this position he was responsible for the entire news content of that paper. When space and atomics became more important he was put on special assignment, developing a science news program for the STAR and its companion paper, the TRIBUNE. In 1959 he commenced writing a weekly science column called "Tomorrow's World," for which he was eminently qualified and which was received with enthusiasm.

Sitting as pivot man on the news desk of one of the nation's leading papers gave Simak a broad view of the world. The belated additions to his family added the humanity to temper his outlook on world events.

These elements are apparent in *Eternity Lost*, a novelet in July, 1949, ASTOUNDING SCIENCE FICTION, in which a senator of the future plays politics with the issue of longevity. Maturity in viewpoint and consummate literary craftsmanship are combined to a degree rarely encountered in or out of the science fiction world.

Horace L. Gold, then in the process of assembling the content of a new magazine titled GALAXY SCIENCE FICTION, had written Simak asking to see something from him just as the finishing touches were being put on the novel *Time Quarry*. Serialization began in the first (October, 1950) issue of that magazine and played a commanding role in its successful establishment.

The novel, an underrated masterpiece, is electric in its spectacular display of writing techniques manipulated to suit the need of the events and impel the reader through space and time with as curiosity-provoking and imaginative a complex of events as ever presented in major science fiction. Simak's concept of a religion of the future is as convincing as it is brilliant.

A man crashes on a world of formless intelligences. They restore him to life and impart to him the secret that they inhabit as parasites every creeping, crawling, flying life form that lives in the universe; that as a race, theirs is the symbiotic destiny, to light the spark that eventually may lead to intelligence.

"Nothing walks alone," is the message they give him. This information he includes in a book which becomes the bible of a new religion. It particularly fascinates the androids, who feel that this common denominator makes

them the spiritual equal of man.

The efforts of man of the future to influence the writing of this book through altering events of the past carries the reader back to the farm where Simak was raised. The author's hobbies, his likes and dislikes, including touches from famous science fiction works, as well as a grizzled image of himself in old age, invest the work with a richness of content that makes it completely satisfying. Published in book form as *Time and Again* by Simon & Schuster during 1951, it unfortunately did not receive the attention it deserved.

FOLLOWING 1952, the year in which *City* received the International Fantasy Award, Simak became the leading symbol of morality among modern science fiction writers; one of the rare few who, while sensitive to the terrible pressures of the time, did not succumb to despair. His fantastic creations became symbols to illumine human problems. As far back as *Hunch*, the "sanctuary" allegorized the dependence of the masses upon the crutch of religion; *Eternity Lost*, in which a politician making capital of longevity discoveries literally loses his immortal soul, figuratively makes its point; *Courtesy* (ASTOUNDING, Aug., 1951) underscores the thin line between dignity and arrogance.

Like Olaf Stapledon, with whom he seems in philosophical accord, Simak represents himself in his fiction as an agnostic, searching the limits of imagination for an answer to the riddle of human life. His work reveals a tendency to depart into mysticism, an indication of fundamental religiosity which Stapledon openly admitted at the very end of his life. The difference is that Simak has not boxed himself in emotionally by raging at the inability of his imagination to answer the impossible.

Carefully exploring the richness of human behavior in terms of the encounter with the alien and the unforeseen, classics of science fiction continue to come from Simak's typewriter. *A Death in the House*, published in GALAXY as recently as 1959, belongs in that category. Delineating the kindness of an old farmer to a dying creature from another world, it is destined to be reprinted often.

Many new writers, among them Chad Oliver, have discovered and learned from the method of Clifford Simak. Yet the truth is that Clifford D. Simak at the age of 57 works so hard at both the technique and substance of the art of being a science fiction writer that he represents a brighter prospect for the future than any newcomer in sight.

THE END



The Council of Drones

By W. K. SONNEMANN

Introduction by Sam Moskowitz

IN science fiction, only three stories by W. K. Sonnemmann are known to have appeared, all published in AMAZING STORIES. His first story, a short novel in the September, 1934 AMAZING STORIES titled *The Master Mind of Venus* received the same sort of reader raves that presaged the discovery of such great names as Stanley G. Weinbaum, Edward E. Smith, David H. Keller, M. D. and others who established themselves with their first story.

The Council of Drones, published in the October, 1936 issue was his second story and it clearly displays the originality of approach and story-teller's narrative of this author. While the skill of the polished professional is lacking in the opening pages, once into the body of the story, the author displays a truly remarkable talent.

If one were to categorize this tale, it belongs in the "life among the insects" class, with *Peril Among the Drivers* by Bob Olsen (AMAZING STORIES, March, 1934), based on the transference

of a man's intelligence to the body of a driver ant, being the closest approach to it. The device for transference of intelligence in Council of Drones is open to question but the author's intimate knowledge of the bee society is not. The fact that a final story by this author, *Greta, Queen of Queens* (AMAZING STORIES, Feb., 1938) involves super intelligent bees lends credence to the supposition that the author engaged in the raising of bees as a profession. When you have finished this story you will believe that science fiction can be educational as well as entertaining. In fact, the question will be strongly raised as to whether or not scientifically informative science fiction isn't far more entertaining and stimulating than a superficially disguised cloak and dagger story transferred to a planet.

The magic of this particular story rests in the fact that the protagonist relates it from the viewpoint of the bee. In contrast we also encounter the situation

from the viewpoint of man, with the same personality sharing both viewpoints. Despite all the foregoing, I have not revealed all the points of originality of this story.

It is unfortunate that, when AMAZING STORIES was sold to Ziff-Davis in 1938, W. K. Sonne-

mann's name disappeared from the role of science fiction writers, never to be heard of again. Upon completing The Council of Drones, I feel that many of you will agree that when Mr. Sonne-

mann decided to leave the science fiction field, we all lost a great deal.

CHAPTER I

THE full magnitude of the genius of Newton Ware had never dawned on me. I was aware of the fact that he was a most brilliant engineer-physicist, but I had always had a tendency to consider him more theoretical than practical. During his discourse on and demonstration of his new invention, which he had named "Cross-Rays, with Lifex Modulation," I concluded that he was not only a genius but also intensely practical.

"I can understand the 'Cross-Rays' term," I said, "because I see that you focus two rays of light upon a spot where they cross, but wherein do you derive the term 'Lifex'?"

Newton looked at me in the manner of an old friend about to divulge a confidence.

"Do you know what life is?" he asked, very seriously.

"No, not exactly." My answer was ready enough, even though I was somewhat surprised, for we

had talked on the subject before.

"Neither do I, but I believe I am on the track of it. I mean in terms of something you can define with scientific accuracy, like vibrations of a given frequency in a given medium. So far, I have learned more about the frequency of vibration and its relation to electrical frequencies than I have about the medium. Because I can not yet define life definitely, I have chosen the term 'lifex' rather than 'life'."

Newton was like that. Even in the face of his great invention, his unselfishness and modesty made him careful lest he should overrate its value even by suggestion in the name. At once his other sturdy characteristics flashed through my mind and gave me a deeper insight into the probable import of his invention.

"Life rays, eh?" I mused, aloud. "Not death rays, and so not an instrument of war. But how does it work? Does it affect life in some tangible way?"

"I called you over to witness

an experiment of the largest magnitude I have yet attempted, if you would care to see it," he replied.

"If I would care to? Proceed at once. I am all eyes."

NEWTON produced from a cabinet a live mouse in a cage.

"I have studied this mouse through that." He indicated a detached part of his equipment consisting of a maze of lights, light filters, screens transparent and opaque, graphs, and something that resembled a pair of binoculars made over.

"I have also studied the family cat, Puss," he continued, "who now sleeps so unsuspectingly on yonder chair. Watch both of them closely."

Newton placed the mouse on a pedestal where the modulated rays of light were made to cross when the apparatus was in operation. He then sat down before his equipment and closed a number of switches starting current to two very large lamps, an X-ray machine, an ultra-violet lamp, and a battery of radio tubes and coils. Following this, he manipulated a number of dials on a panel. Occasionally he paused for a consultation of his notes, which were mostly in the form of logographs. In a moment or two his adjustments were satisfactory, I presumed, for he grasped an

electrode in his left hand and pressed a key momentarily with his right, a look of expectation on his face. The mouse immediately began to behave queerly, whereupon Newton released it from the cage.

It was a matter of several seconds before the answer to the peculiar behavior of the mouse and the cat dawned upon my mind. The life of the cat and the life of the mouse had exchanged bodies! As extraordinary as this revelation was, there was no other explanation to a cat trying to squeeze through a small hole in the wall while a mouse cuffed at it, jumped on it, and bit it. I wanted to laugh, but sheer amazement prevented me, and Newton later told me that I merely sat with my jaw dropped and my eyes popping. Finally, when the mouse began to lacerate one of Puss' ears, Newton called a halt. He captured the mouse as easily as he would a pet cat and returned it to the cage.

"Would you call the experiment a success?" he asked, gleefully.

I was still too amazed to reply.

"Never mind," he continued. "Let's reverse the process first, changing the cat back to a cat, and then we shall discuss the matter."

For all I could tell, he went through exactly the same proceedings as before, but with dif-

ferent adjustments. It was over in a few seconds. The mouse quivered in the cage, frightened, while Puss ceased trying to escape from the room. When the mouse was again released, Puss made short work of it.

"Now," he continued, "tell me how you liked that."

"How did I like it?" I queried. "It was most interesting. I enjoyed the experience thoroughly, I think. But I am still nonplussed. And if this is really the machine that you have been so secretive about the last six months, how in the world did you get thus far along in so short a time?"

"Oh, things just seemed to work out right. The cat-mouse episode was merely the final experiment to confirm my equations in their final form. I am now ready for larger subjects."

"Such as man?" I asked, almost fearfully.

"No less a subject than a man himself, Fred," he replied, quite seriously. "I am hopeful that you might give me an idea as to just what a man might care to exchange bodies with for a short while in order to—well, say, to increase his knowledge. I need some valuable idea so that the first subject could be persuaded."

I THOUGHT this over for a while before replying. A great many thoughts raced through

my mind, and I was highly suspicious that Newton Ware had already conceived the idea that was forming in my own mind.

My mind turned quickly to thoughts of life itself. Sometimes, when things go awry and there is nothing but discouragement on every side, the pattern seems haphazard and purposeless. Then some peculiar coincidence, accident, or happening turns up, that seems to have such definite bearing on the case as to unify the whole of what has gone before, and one wonders whether it be coincidence or a part of an unknown plan. This was one such incident, if I interpreted it correctly.

It had been ten years since Newton and I were college classmates in engineering. Our lives had separated at graduation as we reported to different employers, and now they had been thrown together again in the small Texas town, from which we both hailed, through the operation of economic disturbances. Newton had lost his position when his employer became insolvent, and, after a fruitless search for other work, he had returned, single, to his father's home to play around with his own ideas on his own time until times got better.

As for myself, I had brought my family to my father's farm as a temporary measure to make my

savings last longer while I determined what was to be the next move. I had not been long in finding it. During my absence, my father had acquired a few colonies of bees to manage as a sideline and a hobby, and I was more or less amazed myself at how quickly I, an electrical engineer by training, had become so deeply interested in those marvelous insects. In my consuming desire to find another way to make a living, I found it easy to learn that the country was full of flowers, understocked with bees, and to come to the conclusion that scientific methods and mass production could be applied to beekeeping in such a way as to make it a profitable vocation. I had determined to embark on the venture wholeheartedly the following spring.

And now this had occurred. If a man could really *know* his bees—know everything that goes on inside of the hive and its relationship to instinct and outside conditions—how much better could he manage them? Newton was now offering me such a means of really studying my bees as no other man before had ever been able to apply. Was this a mere coincidence, or—?

"I have a very definite idea," I said, somewhat warily.

Ware was all attention.

"Bees. The ordinary honey bee."

"Just what would you expect to learn?" he asked. The peculiar light in his eyes betrayed a subdued satisfaction, and I knew that I had guessed the truth.

SEVERAL things," I replied. "For instance, no one knows exactly why bees swarm except that it is an instinct designed for the preservation of the species through the establishment of new colonies to replace those that die from one cause or another, or are destroyed. We know that we can keep swarming down to a minimum by giving bees plenty of hive room when they need it, by leaving them plenty of honey and pollen for their own use as food, and by keeping the colony supplied with a young queen so that the bees are contented with their home. Bees will sometimes cast a swarm in spite of these precautions, however, and swarms are a plague to the commercial honey producer who already has as many colonies as he needs. From his standpoint, Dame Nature's method of making two colonies out of one by swarming is merely a division of the working forces resulting in a decreased honey crop. If we could know more about the conditions or influences that cause the swarming instinct to become dominant, we might be able to devise additional means to entirely prevent it. There are several

other things concerning colony life that could be learned to advantage, too."

"Would you care to attempt the experiment as a subject?" he asked, barely able to control his excitement.

"Not today, thank you. I shall have to think about it some. I have a wife and kids at home, you know. It would not be so good if anything went wrong."

"Yes, I know." Newton's manner evidenced both relief and patience.

"Now, if you are interested, let's go into some of the scientific details of this thing."

I spent four solid hours with him and learned very little. It would have been foolish, of course, to expect to learn in four hours all that Newton Ware's brilliant and imaginative mind had developed in six months of diligent effort. I could see that he had several equations representing as many different forms of life, all of them derived by complicated mathematics from one master equation. The variables were the same in each equation, although sometimes with different exponents, but the constants were different for different forms of life. Nature's constant, the natural logarithm, $e = 2.71828$, appeared at least once in each. A constant appeared in the human equation which did not occur in any of the

other equations. He called it the immortality constant. In deriving and setting up the various sub-equations, Newton had had to develop the elements of a new branch of mathematics that was very difficult for me to follow, and, ten years ago, I had made A's and B's in calculus. I became convinced that his particular inspiration for the conception and interpretation of all the equations and the principles involved was peculiar to himself alone, and I rather doubted if anyone else would fully understand his work for many years to come. I gave up at last and took my leave, fatigued, and with a touch of headache.

CHAPTER II

I SPENT a troubled night, alternating between periods of doubt and periods of confidence. I did not consult my wife, of course. To have done so would have been to put an end to all further deliberation. Her vote would have been a most emphatic NO!, and I could not have blamed her. I am open to criticism for not having treated her squarely in the matter, but let that drop. My eyes were turned toward the glorious prize involved. Newton had offered me the opportunity of becoming the greatest living authority on the subject of beekeeping, through intimate first hand

experience, and my ambitions were far from being dead. It was not that I particularly cared for fame that would come to me, but that I did particularly care with all my soul for the means of making a substantial living for my family in a vocation that interested me tremendously. To emerge from the experiment successfully would, without the shadow of a doubt, contribute greatly to my success in my new vocation, for I should know what to do for my bees in their management, how to do it, when to do it, and why it should be done. I would be equipped to become the nation's leading honey producer, and, quite possibly, the nation's most successful breeder of high quality queen bees. But how about the risk involved? I was confident that Newton was a genius, and that, in all probability, the experiment would go through without a hitch. But suppose it did not? Suppose I should die in the experiment, leaving my wife a widow and my children fatherless? I wondered what the percentage was, and what percentage risk of dying I should take without consulting my wife. Perhaps I should have erased the whole thing from my mind, but I could not. Ambition urged me on.

It was not until I visited the post office the following day to obtain the mail that I made up

my mind definitely. An item I had been expecting was in the box, and again the coincidence-factor occupied the foreground of my thoughts. I could not get away from the subtle suggestion that, once again, the means of making the experiment had been thrust into my life. The item in the mail was a queen bee in a mailing cage. I made up my mind definitely, once and for all, win or lose. A few minutes later I was ushered into Newton's laboratory.

I handed him the queen bee mailing cage that had arrived in the morning mail. It consisted of a small block of wood about $1\frac{1}{4}$ in. \times $3\frac{1}{2}$ in. \times $\frac{5}{8}$ in. On one flat side three holes of about 1 inch diameter had been drilled nearly through, these holes overlapping so that there was passage between them, and the cavity thus formed in the block was covered by a piece of wire screen secured by tacks. In this cavity there were one dozen worker bees and one queen bee. The space they occupied, however, was restricted to two of the one inch holes; the other, on one end, being filled with a special candy prepared by kneading together a mixture of honey and powdered sugar. This candy-filled hole connected with the outside world through a smaller exit hole drilled into it through the end of the block and which was also filled with candy.

A similar hole in the other end of the block connecting with the open space that the bees occupied was closed with a piece of metal. It was through this latter hole that the bees had been forced to enter the cage.

"Inspect the future abode of my soul," I said, lightly.

"Do tell! Just which one of these devilish bugs do you wish to be?"

I pointed out the queen.

"Tell me about her," he said.

I INTENDED to. I bought this young queen from a well known queen bee breeder, because I wanted to give his strain of Italian bees a trial. Dad and I have a colony in which the queen is old and failing and we wish to replace her. (Left to themselves, the bees would ultimately raise a new queen themselves, but there is no reason why we should wait on their fancies.) We shall open the hive, seek out the old queen, and destroy her. We shall then place this queen in the hive, cage and all, and close it up. The hive bees will eat away at the candy from the outside and the caged bees will continue to use it for food. In three to four days the candy will be eaten away to a point where the new queen can emerge from the cage. By this time she will have acquired the colony odor, and will be accepted as the new queen of the colony."

"Accepted?" he queried.

"Yes. If I released this queen in a normal colony of bees she would meet her death. Bees, as a rule, will not tolerate but one queen at a time.* They would recognize the stranger as such by her different odor and would put her to death by a means known as 'balling,' in which a tight cluster of bees about the size of your fist surrounds her and literally hugs her to death. Even if she escaped this fate, as soon as the new queen met the old one there would be a fight to the death between them. But, in using the method I outlined, the bees become acquainted with the fact that they are queenless in a few minutes after the old one is killed and are ready to 'be reasonable' when the new one walks out of her cage. The proposition of her acquiring the colony odor is in accordance with the best bee-keeping texts. Anyway, the method works, and it is perhaps the simplest one of several."

"Very interesting," he commented.

"Very. Now, if you are still interested, focus your binoculars and graphically strained light rays on her majesty and measure

* When bees raise a new queen to supersede an old one they will sometimes permit the old queen to live for a while after the new queen begins to function before they kill the old queen. Thus two queens may some times be found in the same hive at the same time. A queen will ordinarily live three, four, or five years if unmolested, but she does her best work in her first two years.

the pulse of her life frequencies."

Newton took up the task with an exclamation of delight.

"You're next," he said, when finished.

"Oh, no! Not yet," I countered. "Wait until she is successfully introduced to the colony. I want to be a queen bee in a normal colony and not a queen bee in a cage."

ONE week later I reported to Newton, rather nervously, that the new queen was safely introduced.

"Now, listen," I exclaimed. "You understand, I only want to make this exchange for a period of five minutes, and no longer. If I get back to humanity without difficulty, I shall consider a longer period of time for the next trip, but I can't learn much this time and be worrying about whether I am going to get back or not."

"Your wishes shall be respected. Five minutes—no longer."

I felt kind of dizzy as Newton turned those crazy looking binoculars on me. I didn't know for sure but what I had a little rather undergo a major operation. At least, in major operations, there were records to show what percentage of cases for different ailments survived. In my particular case, there was absolutely no human precedent. Even granting that Newton was the wizard I

gave him credit for being, I knew that the business of tampering with my mind was risky. I might come out of the experiment alive but without any mind. Good Lord! I had rather be dead! In the latter case, I at least had the present consolation that my life insurance was paid up.

My thoughts, grew hazy. I wondered if I were half hypnotized by Newton's eyes and those ungodly binoculars. Five minutes, then back to humanity, safe, sane and sound. Newton was able to manage it.

"All ready now," he announced. "If you will just step over here under the cross-rays."

I did, numbly. The intense light hurt my eyes, but, through half closed lids, I watched him make the adjustments. Then—

I might as well have been hit by a bolt of lightning. The staggering, man-killing, terrifying jolt that I received can never be adequately described. I might say that, in a way, it felt as if my life had been taken apart, resolved into as many parts as he had terms in his equations, and each part separately treated to hell's fire and brimstone. It was over in an instant, however, and the pain was gone.

CHAPTER III

THINGS seemed so strange. I was different. I struggled to

place myself—to raise my hands to my face to see if I was still here, or somewhere else, and I found that there was no physical response to my will. Then, suddenly, I realized that that, which I had expected to happen, had actually occurred. My own single unit of human intelligence, that which I call I, was now bound up in the physical confines of a queen bee! In spite of the fact that I had expected it, it was a staggering thought to find that I actually was an insect. I had no hands, and no face to raise them to. Merciful heavens!

These thoughts occupied but a moment before the physical senses of the queen bee's body that I now occupied began to make themselves more manifest. There was a sense of hearing that I recognized as such, and a sense of feeling. Struggling to forget the turmoil in my consciousness, I concentrated on these senses to more thoroughly interpret the impulses to my brain.

There was a slight buzz about me. I had thought so at first, half-consciously, and now I was sure of it. And—why, yes, there were a number of worker bees massaging my body with their mandibles. One was even offering me food.

Here, indeed, was a real problem. How was I to take that food? The human impulse to open my mouth failed entirely,

for I had no human mouth to open. It was at once apparent that I must endeavor to establish controlling contact with the nervous system of my new body in order to govern it. How could I? While debating the problem, I attempted to shift my position slightly, much as a human does when he is uncomfortable, or fidgety, and I found to my delight that four of my legs moved. The return impulses that told me that I had moved by means of my legs seemed to reveal the key to the situation in a manner very difficult to describe. It seemed that I must first become cognizant of the parts to be moved, and realize a sense of possession. In a moment, I had fluttered my wings. With the greatest delight in this success and an incomparable spirit of adventure, I concentrated on my mouth parts. In a moment I was fully aware of them and what they felt like, and I had extended my proboscis to sip up the food offered me.

AT the same time that I was assuming control of the physical attributes I was also unconsciously becoming more closely attuned with instincts that seemed inseparably bound up in the queen bee's body. Even though I was already aware of the functions of a queen bee in the colony as a matter of human knowledge, I now became aware

of these functions and duties from the standpoint of the bee. It dawned upon me that I had entered the body of the queen during a normal rest period during which she takes food and rests, and that the rest period was about over. The offering of food that I had received had been the last of several, and, now that it was consumed, I was expected very shortly to be up and about the business of laying eggs for the maintenance of the colony population. Holy, jumping Jehosophat! I, a man, expected to lay eggs! Oh, well, it was a part of the bargain, and it would perhaps be instructive to me at that.

With what was now an almost perfect control over my physical equipment, I set about my duties. Forgetting human will, I gave myself over to queen bee instinct and progressed over the combs, laying eggs in cells prepared to receive them as the urge came. It was rather an easy job, with no hurry, no fretting, and everywhere a circle of worker bees to pay me homage as I passed them on the combs. I paused once in my labors to observe the pollen dance of a worker bee, and again to observe the nectar* dance of

another, those peculiar dances they perform to announce the finding of a new supply in the field. After all, the whole experiment was full of romance and adventure.

It seemed to me that I had been engaged in laying eggs for only a very short period of time when the next rest period occurred. I felt a faint foreboding, but I was tired and felt the need of nourishment, and paid it no heed. The rest period was about half over when, as I was becoming refreshed, the truth of the matter shot through me in its sickening entirety. The working periods of the queen bee cover a span of about twenty-five minutes! Good Lord! What had happened to Newton and his apparatus? I was to be here only five minutes! I knew that nothing in the world that he was capable of controlling would have prevented him from carrying out his pledged word to me, consequently I was certain that some dire catastrophe had overtaken him, and he was unable to return me to my own body. My wife and children—everything that I held dear upon the earth that I had, to all practical purposes, departed from—passed in instant review before my mind. The awful realization that some terrible mishap had prevented the successful completion of the experiment sapped my strength away.

* Nectar is the raw material from which honey is made. It is the secretion of nectaries on honey plants, these nectaries not necessarily being located only in the blooms. As gathered, it is highly diluted with water. The bees evaporate the excess water from the nectar by thorough ventilation of the hive as a part of the ripening process. When thoroughly ripened into honey, the cells containing it are sealed with a capping of wax.

IT was the following day before I could gather the remnants of my horror-stricken mind together to do any ordered thinking. I knew then that it was a day later—the night period having come and gone—and I furthermore knew that any ordinary accident that could have happened to Newton's apparatus, save possibly the breakage of the X-ray tube, could have been repaired by this time and I would have been returned. Some kind of premonition told me that I would never escape from the hive alive, and yet my saner reason told me that it was possible that the X-ray tube had broken, and that in a matter of a few days it could be replaced. I pinned my faith to this hope and set about making the best of the conditions in which I found myself.

It seemed logical to me to begin with a study of my own capabilities and my place and powers in the life of the colony. Almost immediately, in this more relaxed mental state, I discovered that a sense, granted me in my new physical equipment, was of considerable importance, and somewhat of a nature that humanity would call a sixth sense. The organs located in my antennae, those delicate little "feelers" that emanate from the head, were the means by which this

sense was manifest. I relaxed still more, giving myself over as much as possible to the full play of this sense, and was delighted. It seemed double in nature, although I could never be sure whether this was the case, or if there were two distinct senses. At any rate, there was a sense of location. (I recalled having observed, when still in human form, that I had almost never seen a bee leave the hive for a flight in the fields without first stroking her antennae with her first pair of legs. At the time I had assumed that she was getting her "homing instinct" into play—"oiling up the direction finder," as I was wont to put it). This sense of location appeared to be very efficient, and I realized that the defective sense of sight granted me was of small importance by comparison. Without being aware of it, I had been utilizing this sense in making my way about the combs as well as if I had been guided by my human eyes and the broad light of day.

My admiration of this phase of sixth sense, which I shall hereafter speak of as "location," was suddenly interrupted by the manifestation of the second phase, which was a means of communication between individuals. Without sound, of producing which a bee is capable, and without hearing, of which a bee

is capable, I was being addressed through this phase of my sixth sense. I was not being *spoken* to, and yet I know of no better way to describe the transference of thought from one individual to another than to speak of it in this narrative as though so many words had been spoken.

"The nectar is good, Masoul. The nectar is bounteous, Masoul. There is plentiful pollen. Let the life of the city wax strong, Masoul. Let us raise brood to raise more brood."

SIXTH sense told me that I was being addressed by two workers, one an older bee with not many more days to live, and another younger bee. And, I reflected instantly, my name must be "Masoul." Probably I interpreted the meaning of the thought sense as such because I was the soul of the colony, being the mother of all.

"More eggs you would have, Owo?" I said.

"More eggs in the empty cells. It is good to fill all empty cells with eggs of the Owo. But, O Masoul, be sparing of the eggs for the drone.* Just a few of the drones. Our city is now beautiful with many drones. O Masoul, is it good?"

"It is good, Owo," I replied.

Something about it all seemed so droll that I would have laughed if I could, and yet it was

utterly serious. I resolved upon an experiment.

"There will be more food for me if I lay more eggs, Owo?" I asked.

"The food will be good. It will be plenteous, Masoul."

"That is good. But, Owo, please instruct my nurse bees that, while I find the nectar from the mesquite and the pollen from the goldenrod go to make a delightful food, I would like a desert of royal jelly."**

THE experiment was successful from the standpoint of demonstrating a point. I knew, without question, that the thought had emanated from me through sixth sense. I also knew that it had not properly registered in the consciousness of the worker bees. They were creatures of some intelligence, but which intelligence was dominated by the binding chains of instinct. Instinct told them to feed the queen a predigested food of pollen and honey and they could do no other way. They could not vary the proportions, nor could they produce royal jelly for my consumption. Royal jelly would

* The male bee.

** A white, jelly like substance secreted by nurse bees, which is used to feed those larvae which are intended to develop into queen bees. Chemical analyses of the foods given to queen larvae, worker larvae, and drone larvae show that they differ materially in the relative percentages of protein, fat, and sugar. The nurse bees must have a diet of both honey and pollen in order to produce these foods.

never be produced except under the stimulus of a developing queen cell in the hive.

"There will be plenteous food for Masoul," was the reply, and that settled that. I had learned that any attempt to change the routine of life in the colony would be beset with difficulties.

The days began to pass in dreary succession. The only diversion granted to me was to think, and because that process was usually far from being pleasant, there were long periods when I was practically nothing but a machine. I laid the eggs the colony demanded, and it is doubtful in my mind if ever a natural queen laid eggs in such symmetrical patterns, or skipped so few cells as she progressed over the combs.

Occasionally, however, I found myself thinking fast and furiously, usually raging against my fate and the loss of all connection with those I held dear on earth. Self-abasement was often a prominent note in these mental sprees, and each left me a bit more discouraged and dejected. There seemed to be no hope of improving my condition. Even my greater intelligence apparently would not allow me to speed up to any appreciable degree the processes of evolution so that I might effect any changes. As a matter of fact, I was not able to conceive any changes that I

would like to make, that would in any wise alter the fact that, after all, I was queen bee, doomed to exhaust the vitality of my body in the laying of eggs, until age overtook me and death came. Furthermore, I was unable to conceive any means of my own by which I might be returned to humanity. I did not blame Newton for his failure to return me to my own body, but I would desperately have liked to know what had happened. In my discouragement and despair, I relaxed into a state of tired, dull, half-conscious dreaming, allowing queen bee instinct full control in governing my actions.

THEN came the havoc. What kind of mental reaction, if any, is produced in the brain of a normal bee by the smell of pungent smoke I did not know nor care. With me, it wreaked destruction. The first blast of smoke welled up through the hive and strangled me. The fact, that I knew what the smoke was for, was no consolation. I knew that a man was about, and there was no doubt in my mind but that the man was my own father. I remember instantly that he always smoked the bees far more than I did, and I despised him for it on the instant. He knew that smoke takes the fight out of bees that would have stung him, and that these bees, instead of stinging,

become demoralized, and start goring themselves on honey from uncapped cells. Another blast of smoke surged up through the hive to deal me misery, and I fretted and fumed and swore. Forgetting for the moment that the smoke at the entrance was only preparatory to opening the hive, I dashed madly for the top, only to be greeted by the full benefits of a hot, strangling blast as the cover was lifted. Memory returned, and I sought fresh air at the bottom and near the entrance, where fanning bees were laboring to clear the hive of smoke.

It seemed to me that the examination of the colony must have lasted for fifteen minutes. There was no robbing of the hive. It seemed that my father was merely looking things over to see how the colony was getting along. One by one, the frames of comb were lifted from the hive, examined, and replaced. I recalled that in days gone by, when we had worked together in these examinations, we always kept a sharp look-out for the queen to see that she had not been accidentally killed on the last examination, and I knew that he was looking for me. I did not wish to be seen, for I was in no mood for any closer contact with a human and his terrible smoke than could be avoided. I managed to avoid the frames that

were lifted for examination, and to lose myself always in the largest group of bees that could be found. If my father wanted to know that the queen was still alive and healthy, he could determine that by looking for eggs. At the end, the hive was closed, and I breathed a sigh of relief.

The excited activity of the worker bees in clearing the hive of the last vestiges of smoke was efficient and orderly, and accomplished results in a remarkably short time. It was an hour or so, however, before the usual colony activities were resumed, for, on the first blast of smoke, instinct had caused vast numbers of the bees within the hive to gorge themselves on honey from the uncapped cells. Instinct had told them that there was trouble; that they might lose the last drop of the sweet fluid; and that they would need all they could hold, a supply sufficient to last for several days, with which to make a fresh start. Time was required for the scare to pass away and for these bees to disgorge themselves. During this time I was left to my own devices.

IT was perhaps best that little attention was paid to me, for I was experiencing the utmost in mental turmoil and agitation. I am quite unable to explain just how those strangling fumes worked the change in me that

they did, but the fact remains that my outlook on my life in its present conditions was considerably changed. Previously, I had been human in a different form; now, I found that I was neither human in mind nor yet entirely bee. I might say that my mentality was brought more in accord with the self-preservation instincts that are typical of the bee, and that my human intelligence went through a change which did not erase its ability to reason, but which threw its sympathies with the bees more than with humanity. The terrible discomfort I had suffered had removed from me in some way the last vestiges of human emotion, and I can say now, though with regret, that love for my family did not exist. Memory of my previous emotional life was vague, and any recollection that I cared for my wife and children, or any other human, was of no consequence. It mattered only to me that I knew that I was an unusual queen; that I had reasoning powers that were now diabolically cunning; and that such reasoning powers could operate to their fullest extent without losing in any way the connection between them and the natural senses and capabilities of the queen bee body that I possessed. Along with this introspection that revealed my powers, I was conscious of the fact that seeds

of hate for the robbing, smoking humans had been sown, and that I expected to use my reasoning powers to fight humanity and its meddling with our colony life to the fullest extent.

There were signs that the orderly work of the colony was about to be resumed, and I prepared for a round of egg-laying. I had made the rounds of the combs since my stay in the hive, and it was now time to begin over again, where I had originally started, where I knew that bees would be crawling out and vacating cells. With a firm step and a directness of purpose, I made my way to this section, only to find that I was a bit early. I had done good work in the last twenty-one days, and had filled all available empty cells in just slightly less time than is required for the original eggs to hatch, pass through the larval stage, and pupal stage, and emerge. There was nothing to do but wait, and I was suddenly grateful for the rest. I had some hard thinking to do. For the moment, I began a review of the things I knew about colony organization.

WHEN nectar is plentiful and there is much work to do in the fields, the average life of the worker bee is about six weeks. The first two or three weeks are spent within the hive, where the

worker does such inside duties as comb building with the wax secreted from her wax glands, ventilation, cleaning, standing guard, and feeding the young larvae. The remainder of her life is spent in field work bringing in loads of nectar and pollen for use in the colony. At night, when more nectar is being brought in than is required to meet the daily needs of the colony, these older bees assume the additional duty of augmenting the force of bees that ventilate the hive in order to hasten the process of ripening the nectar into honey. Thus, when the season is good, they work themselves to death. Hundreds of them fail to return each day, probably because worn-out wings are unable to carry the load.*

As far as I was able to determine, there was no social organization nor duly constituted authority established to administer colony affairs. The younger bees did the inside work because it came natural to them and because there was inside work to do. The older bees gathered nectar and pollen because instinct bade them do so. Instinct was the same in them all and governed their actions. The same instinct caused them to feed me greater quantities of food as more food

was available in the field, and the natural result was that I laid more eggs to replenish the population. If the flow of nectar diminished I was given shorter rations, laid fewer eggs, and the field bees lived longer. They regarded me as a necessary item, of course, but only as an egg-laying machine. If there were any vested authority within the hive, it rested solely with the middle aged worker bees in the prime of their lives as a group, and as instinct affected them.

It was time to make a change. I expected to take up the reins of supervision myself and control the destinies of the colony. There was no time better than the present in which to begin. Several of the middle-aged bees passed close to me and I halted them with the sixth sense.

"Owo," I said, "I have long been your faithful servant and have done well in filling the cells with eggs. Is it not so?"

"It is well, Masoul."

"I have followed your orders to lay more eggs for more brood under your able direction," I continued.

"It is well, O Masoul," was the reply. "We of the Owos know best how to direct you."

"You lack a whole lot of knowing what is best for you, for me, or for our beautiful city, Owo," I retorted. "I, Masoul, know best."

* During the height of the season the population of a strong colony of bees will run about 60 to 70,000 individuals.

"From now on I am chief supervisor of all activities. You understand?"

PRIOR to that change which was effected in me by my terrible ordeal at the hands of my father and his ill-smelling smoke, I would not have been able to get this idea across. Now, however, I was in more closely adjusted tune with my bee instincts and senses, and the thought registered perfectly. I was delighted, even though the results were not satisfactory. The immediate reply showed this.

"It is not according to the age old plan, Masoul. We die soon, to be followed by others who die soon. We have age. The life of the ages back is in tune with us, and we know from the ages. You must serve us as Masoul has always served us."

I knew that what they meant was that instinct was stronger in them than in me, therefore, according to instinct, they should direct. The queen of the colony, preceding me and from ages back, had been a creature of less intelligence than even the workers, and that she had always followed the direction of the workers in whom instinct was strongest. They did not know that I was different.

"Owo," I replied, "the ages are dead. My Masoul mother is dead, and I am different from

her. I have the ages in me, but I also have the future. I am different. I am stronger than you as no Masoul has ever been. I know best. You will follow my direction."

I had made a distinct impression, possibly because my will was strong, but I did not take time to rejoice over it. I was surging forward.

"What would you have us do, Masoul?"

"I would have you prepare yourselves to fight away the smoke and the man. You enjoyed them?"

"We did not!"

"I will deliver you from them. We will gather nectar for our own use, and not for the use of man. We will have no more smoke after a while. We will have no more robbing after a while. We will conquer man. But it will take planning and organization."

"O Masoul, if you can deliver us from man and his smoke, we shall have even a more beautiful city."

I properly understood this to mean that life would be more pleasant.

"Very well, Owo, we shall begin. You have six legs. You can count to six?"

"We can number for our legs, Masoul."

"Then I direct you to form a guard of seventy-two bees, and yet another guard of like num-

ber, and yet another guard. You do not comprehend seventy-two, but I shall teach you. Choose you from among the aged, field bees the number of six, one for each of your legs, and number one leg for these six bees. Do this again for another leg, and again until you have six bees for each leg. You will then have thirty-six bees. Choose another thirty-six bees, and then you shall have the seventy-two bees which I charged you to get. We shall call this the number one company, and the first six bees shall be leaders. I want three companies."

BY dint of much effort and repetition, I got the idea across so that these workers knew just how to choose three companies of seventy-two bees each. I had rather have had companies of an even hundred, but this, I felt, would require too much effort.

"We shall choose the guard from among the old field bees, Masoul."

"It is good, Owo. And I have fair reasons to choose the guard from the older bees, as you shall see. You remember the smoke today?"

"We were present, and we suffered much."

"How many of my bees stung the man? How many of my bees died?"

"But one of us stung the man. She lost her stinger and died. Two bees were crushed by his clumsy hands as he went through our beautiful city."

"Were they old?"

"The two crushed bees were young, Masoul. The stinging bee was old."

"The stinging bee was old," I replied. "She would have died soon. She lost not many days of useful life in gathering the nectar by stinging the man. It is better so. If young bees sting the man, then we lose many days of life, and our city loses. Let not young bees form the guard to lose many days of life. Let always the guard be formed of old bees who have not many days to live. Are my thoughts not wisest, Owo?"

"O Masoul, you have more than the ages in you."

"Then be about your task. When you have organized the three companies come again to me, and I shall further direct."

"We go."

CHAPTER V

IT occurred to me when they were gone that I had taken a tremendous responsibility upon myself. From now on I had to perform in order to warrant the confidence I had just gained. If it required only the skill and patience necessary to keep a military or-

ganization on duty and suitably directed, I had little to worry about, for I felt completely capable of that feat. On the other hand, I was not sure that a military organization such as I planned would accomplish the results that I had promised. I had promised to free the colony from the meddling of man. If the first step failed, I must think of something else. If I failed altogether, then what? To tell the truth, I was suddenly a little afraid.

My newly found worries were short lived. Underneath my feet a young bee was gnawing away at the capping covering her cell as she prepared to emerge. I moved away to give her room, and began to reflect upon the subject of how difficult it was going to be to persuade a company of seventy-two bees to attempt to sting a man all at once. I did not reflect on this subject long.

The emerging bee completed her task, stood for a moment drying her wings and massaging her antennae, and then became aware of my presence.

To put into words of the English language the thought that emanated from the young bee is an extremely difficult task. In English, it almost sounds ridiculous, yet, from the standpoint of its startling effect, she might as well have spoken the following:

"Why, hello, Mom, old girl. What the Sam Hill are you doing here? What am I doing here?"

Having finished approximately this thought emanation through sixth sense, the newly emerged worker was quite evidently as surprised as I, and incapable of further communication at the moment. To say that I was surprised would be putting it mildly. Paralyzed, I clung to the combs, my mind alternately racing in thought and frozen in consternation. At length I recovered sufficiently to "speak."

"What did you say, Owo?" I might say I gasped.

"I hardly know, Masoul. What is this? What is it all about? I find myself a newly emerged bee. Instinct pictures my life plan before me, and yet it does not seem quite right. Why should I be a bee?"

THERE could be only one possible explanation of this most unusual situation wherein a worker bee seemed to exhibit an intelligence akin to my own, and I conceived it. In haste, I proceeded to explain to this new worker my theory of how it came about with the intention of enlisting her aid in explaining to the other thousands of workers that would be emerging from now on.

I told the new worker that mentally I was human, and phy-

sically a queen bee. Passing briefly over the fact that my intelligence had exchanged bodies with an insect as the result of an unfortunate experiment that had been only half completed, I next informed her that she was the first offspring from eggs laid by my body after the change. As such, through the operation of hereditary laws, she had been endowed in half with human intelligence, doubtlessly of limited capabilities by virtue of the fact that half of her hereditary gifts came from the drone father, which had mated with my queen bee body before my occupancy, and which drone was, of course, merely a normal male bee. I told her that I could expect much more from her in the matter of cooperation, and from her new sisters, than I ever could from those workers which had developed from eggs laid before that fateful experiment 21 days ago. Still more briefly, I explained that I had assumed control in the colony for the betterment of our lives, and that I expected her and her sisters to fall readily in line. The reason for my haste in this explanation was good, for all about me young bees were gnawing away the cappings of their cells. I dispatched the new worker to the nearest with definite instructions to repeat this story to the emerging bees as quickly as possible.

I repeated my story to a half dozen surprised new workers, organized them into a corp of instructors, and then obtained respite. My instructors worked fast and each new bee became a recruit so that my services were no longer needed. My prediction had been correct, for each new bee was found to be half-human in intelligence.

I WAS glad at the cessation of my labors, for I wanted to think. Certainly I must be right, but how? Another bee with intelligence derived from me! It seemed preposterous, but it was so. I had dismissed the problem as solved in my first haste by assuming that hereditary laws were responsible without knowing exactly how. Now that I had more time to think, the complete explanation gradually worked itself out in my mind.

I had entered the insect body and had taken complete control of its functions. The body muscles responded to my will, thus indicating that my mentality was in controlling contact with the nervous system. If this be so, and it certainly was, then why should not the bodily processes, through which chromosomes are formed, also be in tune with my life through the nervous system equally as well as it was in tune with the former queen? The results proved the

point. Then again, I thought, the capacity for intelligence must certainly be a dominant factor as treated in the Mendelian law of inheritance and not a recessive factor. As such, it would certainly be transmitted to the offspring. Dismissing the problem as solved in so far as I had need to solve it, I deliberated upon the vastly changed circumstances.

THE entire population of the colony would be of my own offspring in a few short weeks, all half human in mind, and the work of organization, planning, and execution of details would be vastly simplified. I might even go so far as to obtain advice from some of my offspring, these being perhaps somewhat more in tune with bee instinct than I, but this point was yet to be demonstrated and there was no hurry about it. There might even be some pleasure in existence now, with individuals to converse with. Furthermore, improved means were at my command for carrying on the fight against humanity. A sneering thought occurred to me that humanity itself recognized the fact that the mastery of the world was still in dispute between itself and insects, and that only by its greater intelligence did man have any show at all. Now things were to be changed. My colony of bees was fast becoming

endowed with a certain degree of man's most important weapon. Ambition awoke in me. Such being the case, why should I not set my goal at complete mastery of the world for the benefit of the bees alone? A riotous thought that set my heart to pounding. Plans—plans—what a world of plans to be made lay before me.

Before evening came, with its cessation of field activities, those Owos that I had sent to organize companies of fighting bees returned to report the completion of their labors. I gave them instructions as to the disposition of the guard. One company was to remain in flight about the hive and at rest in the trees during the day ready to attack man at the least provocation. Another was to remain on duty about the entrance and just inside, to attack at the first smell of smoke, and another was to be on duty at the top of the hive prepared to fight if the hive were opened. It was well enough to proceed with this plan, even though I expected changes to be made as the older bees died and my own offspring became predominant.

The sun went down, and in the evening's twilight vast numbers of laboring field bees, that knew no other life than to work, returned to the hive. Some of these returned only to continue their labors by fanning their wings, while others clustered about the

entrance, contented, resting, and perhaps thinking of flowers. It was better not to disturb them, so I called together those bees in which I took great pride, my own offspring, for a conference in the upper portion of the hive.

"Owos, you know your existence," I said. "You have been told wherein you are different from your predecessors. Are you content?"

The first few that I had had contact with acted as spokesmen, and I found it convenient to name these. I called them Mary, Lucille, Ann, and Betty. Mary replied.

"We know that we are as we are, Masoul. There is nothing that we can do about it. We seek that happiness that may be granted to us in our short span of life."

"I hope that I may do much to improve your lot," I replied. "Your lot is most amazing and unnatural, even as mine is, and we shall work together to do the best we can."

"We are willing to cooperate, denying those instincts that tell us that we, as Owos, should direct you, not you us," said Ann.

"It is best, Ann," I said. "You are half as I am, else you would not see it so readily. And I shall always continue to have more experience than you, for I shall live through more than you, your days being more numbered."

"It is too true, Masoul."

"Perhaps not quite so convenient, Betty. For, if my plans do not work out to perfection, I shall live through more smoke than you, and smoke is most distressing."

"So instinct tells us."

"Chalk up a score for instinct. But I mean to eliminate the smoke, and to conquer man. Perhaps we may reduce the world to a land of flowers and bees in the end."

"Would we live to see it?" asked Lucille.

"I doubt it," I replied. "But during your lives we can do much."

I outlined to them the plan I had conceived of making my colony a nest of incorrigible, unmanageable and fighting demons as a first step in resisting the meddling of man. Questions were asked and answered, and I found myself surrounded by a group of bees that held me in the highest esteem.

Conferences with my new Owos were held each night for three nights, and it may perhaps seem strange to the reader that not a great deal was accomplished in the way of additional planning for future combat. The seeds of future ideas were being sown, however, for I was rather bothering over the fact that bees have to die when they sting. With my own progeny coming on, I

hated to see them die even a few days before their time.

ON the third day after the emergence of the first of my brood, I found myself over a section of comb in which I had laid drone eggs that first day I was in my new abode. Whereas worker bees take 21 days to emerge from the cells as young bees from the time the egg is laid, drones take 24 days, and I knew that these drones were about ready to crawl out. There was evidence that several were already in the process, and I decided to wait around a bit and start them on the road to learning. My loathing for the lazy drones would probably subside with my own drones showing signs of intelligence. I might even put them to work in some fashion.

The emergence of the first drone was considerably different from the emergence of the first worker. This drone, which I afterward named John, seemed to look me over calmly enough before "speaking."

"Masoul seems to be thinking hard with me as a subject. What is the trouble, Masoul?"

I was surprised at this comment, and taken somewhat off guard. This drone seemed to exhibit even more intelligence than my new workers, and I was unprepared for it. In a moment,

however, the solution was clear, and I changed my discourse of enlightenment to this drone accordingly. I had entirely overlooked the fact that a drone bee is a development from an unfertilized egg, and that this bee in no wise owed his development to an immediate father. Such being the case, he took his heredity from me alone, and was consequently less cramped in his human intelligence characteristics than his sisters. What a remarkable situation! I realized on the instant that I might make great use of that.

In the evening, I called a conference of newly emerged drones.

"Well, boys, how do you like it?" I asked.

"Not bad," replied one I had named Paul. "We are drones, with instinct to tell us that we are men of leisure, fed free of charge by our worker sisters, and with intelligence to make the most of leisure. I advocate reorganization of colony life, with worker bees to put on shows for our benefit."

"Well, I'll be—," I burst out.

"Never mind Paul, Masoul," said John. "I think he is a misfit—a black sheep in the family. He had no sooner emerged than he started griping about the cramped quarters in his cell. Said he wished the workers would learn to build drone cells a little larger, and that his won-

derful form might have experienced a fuller development in larger quarters."

"Should I decide that Paul needs attention from the workers he holds so lightly in his esteem, he will not be so handsome," I replied. "Minus a wing or two torn off by their mandibles, and with a shrunk abdomen from lack of food, his form will be nothing to brag about."

MASOUL," said another I chose to call Fritz, "I have talked with several of my brothers since emergence and we are of the same mind. We have instinct that tells us what is expected of us, which is nothing, of course, there being no mating to be done*. But, Masoul, the intelligence we possess is to our liking, and we find that we do not wish to be considered lazy individuals with no aim in life. Could you, Masoul, find us anything to do?"

"You did not come equipped with physical attributes that would enable you to do many things the workers do," I answered. "You have no pollen baskets on your legs for the gather-

ing of pollen, and, for similar reasons, you can not gather nectar from the fields. Without wax-secretion glands, you can not build comb. But I think I can find inside work for you that will help the city by the removal of that many workers from those duties."

"Let us hear, Masoul."

"You have not yet flown. You will leave the hive in a few days to try your wings in flight, and make them stronger. You will note the wonderful buzz that you will make with your wings, for you are strong. Therein lies your only chance of being helpful at present. You shall use your wings for fanning, and with your magnificent wings keep the city ventilated to perfection. Is not all this a worthy occupation for you?"

"That sounds like work," lamented Paul.

The next day Paul started on a diet of nothing, followed by nothing, at my orders. He was dragged from the hive three days later by two capable Owos and left to die some distance away. I had no time for such characters.

THE following evening I talked with a considerably larger number of drones.

"More possibilities are unfolding before me," I began. "It furthermore gives me great comfort

* A virgin queen takes her mating flight when she is from five to eight days old, weather permitting. She soars high into the air and mates with a single drone, this drone dying instantly in the act. On her mating flight she receives enough of the male sperms to do her for the rest of her useful life, the quantity of individual sex cells being measured by the millions. Only rarely has a queen been known to take a second mating flight.

to be able to talk things over with you, for your intelligence is freer from the chains of instinct that bind my Owos. Let us work together for the carrying out of our plans to make our city supreme over humanity."

"We are most willing, Masoul," said Omar. "Even though we take heredity direct from you, you are still greater than we. Dictate, Masoul, so that we may follow with the gift of your intelligence."

"Omar, your words are wise, and yet too modest. If I shall dictate, let it be with consideration, and should you perceive that which I do not perceive, then, by all means, give me the benefit of your perception."

"Masoul, you welcome free discussion with us concerning your plans?"

"Most heartily, Omar."

"Then, Masoul, what plan have you for your successor? Instinct tells me that you will live not always, and that, in the to-morrow of nectars, your Masoul daughter will mate with one of my yet unborn brothers. What shall we do?"

To tell the truth about it, I had not given this much consideration, and the question was somewhat staggering. But, for the sake of wholesome respect, I had to keep up appearances.

"A problem of to-morrow's nectars, Omar, requiring thought

between now and then. I have not yet determined fully. Think about it, Omar, and give me the benefit of your thoughts."

So I successfully parried the question. But my relief was short lived, for Fritz was as bright as Omar, and he absorbed my attention.

"Masoul, the workers of the guard die when they sting the man?"

"It is so, Fritz. It is for this reason that I form the guard of older bees who are doomed to die soon anyway."

I was distinctly proud of this idea.

"It is wise, Masoul, and your mind is great," continued Fritz. "But why do the Owos die? We have no stings and we do not know."

"It is because the Owo's stings are barbed. They loose the stings in the flesh of the man they sting. The injury causes them to die. My sting is not barbed."

"It is unfortunate," commented Fritz sadly. "It is not right they should die."

I was disturbed again. Something in the lamenting tone of Fritz, as he regretted the fate of his sisters of the guard, seemed to imply that he seemed to think that I should be able to remedy the situation, or that he would be distinctly glad if I could. That was enough. I brought the conference to a close for the evening,

but not before appointing Fritz and Omar as my immediate assistants and advisors.

CHAPTER VI

THE following day was historical in my existence in the colony. The smoke came about midday. At first, there was only a trivial attack. A few blasts of smoke at the entrance caused me dire discomfort, but they were of short duration. My first two companies of bees went into action, and 25 bees from the two units died from losing their stings. I did not wonder that the man retreated, but he was game, and I marveled at his courage. He returned in a short while, this time heavily dressed, wearing bee veil and gloves, and we suffered at his hands. When he was through, and I thought I was half dead from smoke, we found that robbing had taken place, and that we had lost much ripened and capped over honey. My rage knew no bounds.

When evening came, I was an excited leader over the conference, and this time the conference was graced by the presence of a number of my own Owos selected with my utmost care. I began by addressing my remarks to the group.

"We have once more suffered at the hands of man. We have taken our toll in a measure, but

he has taken his toll. The man does not rejoice over his stings, and we have begun the war. His toll was heavy, for he has taken much honey that would have nourished as well when the nectar is no more, and the cold causes us to huddle together. We have lost our first battle with him, but there shall be more in which we shall not lose. It is time to carry the war to him; not let him bring it to us. Hear my words.

"Fritz, you were sad that your worker sisters die as they sting the man, and you caused me much thought. I, too, am sad. It must not be. We can not always fight man so if our success be no greater than today. Therefore, I say, the workers of the guard shall no longer die. They shall no longer lose their stings, and every worker shall be a fighter. We shall carry the battle to the man. We shall seek him out and sting him. We shall attack him in great droves and seek to kill him. We shall seek out his woman and sting her, and his children. They can not wear the veil from dawn until evening, and we shall kill them if we can. If we can not kill them, we shall drive them away.

"This is my plan. My Owos will not die. If their stings have no barbs. Therefore, we must remove the barbs. I know the way."

There was a chorus of ques-

tions from many in the group.

"The way is easy, and yet it may be hard."

MY proposition was to assign a certain number of workers, say twelve, to the duty of finding a sand bed, and, having found it, to bring to the hive large numbers of sand grains for my inspection. From these, I would pick two having sharp edges of the most perfect form suited to the need, the remainder to be carried away. Having selected two suitable grains, I would then assign workers to the duty of mounting these securely in one corner of the hive where they would be readily accessible and yet obscure to the man. The mounting was to be accomplished by the use of propolis, a gummy material obtained from the buds of poplar and other trees and known as "bee-glue" which is used for sealing cracks and for other purposes. It would require the utmost care, for the sand grains were to be mounted with meticulous accuracy, the spacing between the cutting edges probably requiring an accuracy down to one one hundred thousandth part of an inch. After the sand grains were mounted properly, the next step would be to have each worker bee in turn thrust her stinger between the sand grains and shave off the barbs. Any worker could then

sting the man with impunity and repeatedly. My guard could be chosen from bees of any age, and the entire population of the colony would serve as reserve forces."

It was not at all difficult for me to sell this idea to my followers, but the matter of making clear to the workers just what sand grains are, or where they would be found, was extremely difficult. In the end I made arrangements to fly from the hive with a limited number of workers the next day, all instincts to the contrary notwithstanding, and personally take part in the search for a bed of sand.

Luck was with me the following day, for I found a suitable bed of sand in a creek bed in a relatively short time, and my accompanying workers brought back dozens of grains on the first trip. Not one of these was suitable, however, and I detailed fifty workers to the duty of bringing sand grains to the hive.

It required two days' time to find two grains of sand that had sharp cutting edges in a straight line sufficiently long, and I was heartily glad when this step was over. I had looked at sand grains with my poor vision and had utilized my sense of location to such an extent that I was most thoroughly worn out, for I had endeavored to carry on my usual duties of egg laying at the same

time. Little did I then suspect, however, that the hard part was just about to begin.

BEES are credited with marvelous accuracy in building their combs with cells in the hexagonal shape, of given size, and with certain angles to give the greatest economy of wax together with maximum strength. I had found the comb work in the hive to be marvelous, especially considering those cells in which I laid eggs, and I had relied upon this accuracy of workmanship to make the matter of mounting the sand grains a simple matter. I was badly disappointed. Bees have built combs for ages, and instinct tells them how to build it well. Bees have never mounted sand grains by means of propolis for the purpose I intended them, and they knew nothing about it. Six of my own Owos labored long and hard at the troublesome task and made small progress. Time and again the mounting was finished only to be torn down and started over, either because the sand grains were too far apart or too close together. More than one of my Owos would have lost their lives in trying out these shears when it was thought that the perfect dimensions had been obtained, had it not been that my intelligent Owos were able to undo what they had done and re-

move one grain when it was found that the experimenting bee had hopelessly bound her sting in the shears. The first day of failure made me extremely impatient, but the following day I regained some of my patience and resolutely assigned a detail to the duty of completing the shears whenever it could, working continuously on this one job. In the meantime, I had other details to think about.

The somewhat disturbing thought that perhaps I might not win in my battle with man kept bobbing up. The fact that man may provide himself with veil and gloves to protect his face and hands and dress heavily to avoid stings on the body gave me no little concern. The man had deliberately robbed my colony after twenty five of my guards had stung him. A thousand bees might sting him without his safeguards, now that I planned to remove the barbs from their stings, but if my fighters could not get to him, the battle would be lost. On the other hand, he could not wear these safeguards all day long and each day, and my bees could sting him freely when his safeguards were off. But what reaction would come? I could guess the answer to that. Knowing that this colony was becoming incorrigible, he would in all probability obtain a new queen from a professional queen-

breeder and introduce it to my colony after he had searched me out and killed me. This thought at once modified my plan of action.

BRIEFLY, I must not carry the battle to the man until I was fully prepared. I would proceed about the business of removing barbs from the stings of each and every worker bee, but I must wait until all were my own offspring so that I might be more able to instruct them in the art of fighting. I believed that I could teach my half-human-minded bees to crawl inside the man's clothing and sting him at such times as he was heavily dressed. This was one point, but it was not sufficient.

Man is obstinate, and hates to be outdone by animal or insect. My ultimate fate would be to die at the hand of man, but so great was my hate for man that I did not care. When I was gone, however, I would not be able to carry on the battle; therefore, I must plan for the future about which Omar had asked. Not only plan, but I must act now, and the action required that new queens, Masouls, be reared at once. I would send these queens from the hive in swarms to establish homes in hollow trees and caves so that my blood would not be lost, and so that the battle to last for years would be carried

forward by an annually increasing number of colonies. Personally, I preferred to remain in close contact with man, fighting him until death, and I would not follow the instinct that directed that the old queen leave with the swarm. Then the matter of the characteristics of my Masoul daughter occurred to me.

She would not be as I. Being raised from an egg exactly similar to those that produced my half human-minded Owos, she would be as they, and would have only half of my capabilities. But then the remarkable side of it occurred to me. In mating with one of my own drones, she would have offspring even better than mine, for they, taking one half of one half from their mother and a full one-half from their drone father, would be, I might say, three fourths human minded. What an idea! Let us rear a new queen, keep her in the colony for a time, and rear yet another queen from her eggs to mate with one of my own drones. Thus would be produced a queen having three fourths of my capabilities who would produce offspring having seven-eighths of my capabilities. This fraction could be increased to almost unity after many generations, and it would not matter at all that I died. I settled on this plan immediately, determined to study new queens and new brood in-

tently, until such degree of perfection was reached that I would feel safe in directing the casting of a swarm.

Before giving further attention to the construction of the barb shears, I personally attended to the matter of directing the construction of a queen-cell. I selected the most perfect appearing egg from a large number, and directed that a queen cell* of the largest, most perfect form possible be constructed, and that every care be exercised in giving the developing larva the proper food. This work had been under way for a week, and it was almost time to cap the queen-cell, when I again visited the site of the barb shears.

NO progress had been made whatsoever. The shears had been reconstructed perhaps thousands of times, and my half-human-minded Owos were showing a real characteristic of humanity as opposed to the bees. They were becoming discouraged. I found it necessary to take a hand, not only to accomplish results, but to maintain respect. I studied their

methods and then conceived the means.

I directed an Owo to find a dead Owo and bring her back to the hive. This being done, I directed that she be dissected to the extent that her sting could be removed, and this was done. I then directed that one Owo grasp the base of the sting between her mandibles and draw it back and forth between the sand grains as other Owos manipulated the propolis mounting in such fashion as to gradually bring one sand grain up to the other with the sting between. I stood by to watch the results. Gradually, the two sand grains were brought closer together until there was no clearance between them and the sting of the dead bee. Then contact was made, and a minute quantity of the barbs was sheared off. Still closer contact was made, and every last vestige of the barbs was removed. I halted the work, directed that the grains be securely fastened so, and asked for volunteers to try the shears. A dozen stepped forward, thrust their stings through the shears, and had the barbs removed without one iota of ill effect. I rejoiced that success was mine.

Perhaps half of my colony had used the shears when the smoke came again. At the time, I could not quite account for the manipulation the man made. We had

* Natural queen-cells are usually constructed by the bees along the lower edges of combs or in the corners, and they point downward. Numerous queen-cell cups, which are the bases of such cells, will usually be found in any colony. When the bees are ready to rear a queen, either the queen deposits a fertilized egg in one of these cups, or the workers transfer a fertilized egg from a worker cell to a cup. From then on, it is a matter of feeding the developing larva the properly proportioned food and building the cell down to enclose the larvae.

already been robbed, and we had not yet accumulated enough stores to warrant another robbing. I could only guess that the man was angry because we were intractable and was looking us over for whatever he might find. He found the queen cell, which had now been capped, and, to my extreme disgust and surging hate, he removed it. If I had been human, I am sure that I would have died of brain trouble of some sort, for my anger, rage, and hate consumed me. Not only did the smoke make me as sick as ever before, but my plans against the man were retarded by man's own hands. I can not describe it, so the subject may well be dropped.

There was nothing to do but start over again, and I directed the construction of a half dozen new queen cells in as remote corners of the combs as possible. I also directed that, should the hives be opened again, large numbers of Owos cluster over these cells and hide them from view as much as possible. In the meantime, every Owo passed her sting through the shears and was made a fighter of no mean possibilities.

Under the stress of disappointment, hate, and foiled plans, I lost my judgment, and directed that the fight be carried to the man at once with barbless stings in the hope of killing this partic-

ular man at once. I directed that a company of two hundred bees seek out man and his kind every hour of the day and sting him unmercifully. The havoc this campaign wrought I learned about fully at a later date. My wife and my children were forced to stay indoors, but my father took action.

In justifying my action, I contented myself with the thought that I had taken it up with Omar, Fritz, and others in my council of drones and obtained their assent. I overlooked the fact that in successfully completing the barb shears, and in planning for the breeding of my successor, I had so completely won their confidence and respect that they had virtually become what humans call "yes men." They regarded me as wise beyond comprehension, and thought that I could not fail. They sought to aid me in carrying out my plans rather than in looking for possible defects. But perhaps it was better so.

THE day came very shortly when I realized that my father would not give up an inch in his battle with my brood. The new queen cells were only fairly well under way when he came again with the stench of rolling, billowing clouds of smoke, and dressed to perfection as a guard against stings. I was shortly

very nearly unconscious, for I had never before experienced such terribly thick and completely awful clouds of smoke. They rolled about me and obscured my vision, and so distressed my breathing that I was incapable of any degree of muscular activity. In this condition, I was barely conscious that the hive was being most thoroughly searched for my presence, and, in the end, I was found.

In the few short seconds when a person realizes that death is inevitable a myriad of thoughts can race through his mind. It was so in my case. I saw the approach of a bright, shining tool, and I realized that the end was near. I recalled that bright tool. It was a pair of thin nosed, nickle plated pliers. I had used those same pliers, in company with my father, in picking the queen from the combs that my own body had replaced. Now it was my turn! My father probably reasoned that the offspring of the new queen would be more easily handled. There was no reason why he should not think this, for ordinarily, the bees we kept were not at all ill-tempered. He very likely thought that, while my parent stock was probably satisfactory, I was a freak that produced near demons instead of bees.

I had perhaps a split second to think these things out as I saw

the approach of the pliers. I was too weak to run or fly. I attempted to give orders to those workers near me to never accept the new queen he would introduce, but I was too late. The pliers closed on my thorax, and I was lifted from the comb.

I did not meet instant death. The principal contents of my thorax were muscles for driving my legs and wings which were attached thereto. The heart and other vital organs reposed in my long, slender abdomen and these were unaffected. While I knew that death would ultimately come as a result of the complete crushing of my thorax, I could only suffer untold agony at the moment. When cast aside, I fell, mortally injured, in front of the entrance to the hive.

FROM the point where I lay I watched the activities as I suffered in silence. The heavenly fresh air on the outside, totally free from the strangling fumes I could see emanating from the smoker, was a blessing indeed, and cleared my senses. I saw my guard fight the man and was proud of them. They flew before him in droves obscuring his vision, and retired for the moment only when greeted by a blast of smoke. I could see the man wince and slap at his body, and I knew that some of my beloved Owos had penetrated his clothing, to

meet their deaths in the performance of the duties I had assigned them. I did not relish the thought of dying and leaving such loyal subjects behind. I had learned to love them, just as I had learned to hate mankind.

I was almost gone when the man retired. I was missed in a short while, and a number of my faithful Owos, searching for me, came upon me on the ground. A little while longer and they would have been too late.

"Oh, Masoul, what has he done?" asked one of my most trusted Owos.

"He has killed me, Owo," I replied. "In a short while I die."

"Then what can we do?"

"Has he placed a new Masoul in the city?" I asked.

"That he has, and she smells not right. We have tried to kill her, but we can not reach her."

"You will reach her in a few days; and then you must kill her, even though her smell is good. You understand? You must kill her."

"Masoul, we may kill her, but he has destroyed our queen cells. What shall we do for Masoul?"

I thought a moment before replying, and when I "spoke" again, the clouds of death were hovering near.

"Owo, my faithful Owo, hear me. I laid eggs to-day, and in three days they hatch. After one or two days, the young hatched

larva is not good with which to rear Masoul. You must work fast. I charge you, Owo, select a great many Owos and fly to the woods. Choose a hollow tree that is remote from man and hard for man to find. In that tree build comb rapidly ere the three days expire, even if it be but a small amount. As soon as this is done, choose three or four eggs and fly with them to your new city, and rear Masoul there. Take with you my drones. One of them shall mate with new Masoul. When Masoul lays eggs, come back to this city, and persuade every Owo and drone to fly with you to the new city. Carry with you all the honey you may. Rob this city for the benefit of the new. Abandon this city when the new Masoul shall lay eggs. Carry with you in your minds those things I have taught you, and carry on the fight against man."

If I had been speaking by the use of vocal cords and respiratory apparatus, I am sure that the last few words would have come in gasps, or perhaps not been said at all. Sixth sense was failing me even as I endeavored to emanate the last of these thoughts, and I was not sure that they were all properly comprehended. I "heard" no reply, for the dark clouds that were hemming me in settled closer until it seemed that they covered my pain-racked body with

downy softness, and I went to sleep—blessed, restful sleep.

CHAPTER VII

I DO not know, of course, just how long the reverse transfer took, but it seemed to me but an instant before I was again conscious, and in human form. I opened my eyes, cautiously, half fearfully.

Directly in front of me a few hundred feet away I saw a rather large, red sandstone building. There was a helpful sign across the entrance to disclose its identity. It read: "Dr. Ray's Sanitarium." There was a large, beautiful, shady lawn between me and the building, with here and there a patient in a wheel chair with attendant nurses. Restricting my gaze to my own vicinity, I found that I, too, was in a wheel chair, and that within a very few feet there was a quite good looking, white-clad nurse calmly reading a magazine.

It was several minutes before I ventured upon a conversation, for I wanted to make sure that I would be quite calm myself. At length I thought that my poise would be secure.

"Good morning, Nurse," I said. "Would you mind telling me just why I am here?"

I have never seen anyone so surprised in my life. She dropped her magazine instantly, and

came, I think, very near to fainting.

"Why—why yes! No! How do you feel?" she gasped.

"I feel quite hungry, Miss. I'd like to have a big beefsteak smothered with onions. What are the chances?"

By this time the nurse was on the road to recovery.

"Your chances are excellent," she replied, smiling. "There won't be a one of us that won't be so darned glad to see you feeding yourself that we won't know what to do. You have been the most helpless man for the last two months that I ever saw. In fact, you have been nothing more than a lump of clay with life in it, and you would have starved to death if we had not resorted to forced feeding. But come on. You are going to see Dr. Ray before you do anything else."

My rides in a wheel chair have been distinctly limited. If I ever have to ride in another one, I hope it won't be quite so fast. Nurse broke the speed limit across the lawn.

Dr. Ray was quite astonished at my instant recovery, and asked all manner of questions, which I side-stepped to the best of my ability. He became exasperated.

"It would be a great help to us if you would give us some sort of inkling as to what happened," he snapped. "It might help us

some in our treatment of Newton Ware."

"Oh, is he here, too?" I asked, instantly.

"He most certainly is. The two of you completely out were found in his laboratory in the midst of an array of broken equipment. You had apparently had quite a struggle, and we are quite sure that either you hit him on the head with some heavy equipment, or else he fell into it with tremendous force. He has been a much better patient than you, however. Most of the time he is fairly rational, but a part of the time he sits around with his inseparable notebook, studying it, and mumbling about a constant for a queen and 'a period of five minutes, no longer.' When he does that, he sees nothing, hears nothing, and looks very much as if he has a terrible headache. His trouble is undoubtedly caused by the blow on the head."

"Perhaps it might help if I could see Mr. Ware and talk with him," I suggested. "A sudden shock, you know."

"I wanted to try that."

WHEN Newton was brought in I looked at him intently, spoke his name quietly, and continued to look at him.

It was apparent at once that my presence, actions, and voice were having an effect. Newton's eyes were perfectly dull when he

entered the room, but now there seemed to be a trace of returning brightness appearing by flashes. The struggle within him went on for five minutes before the victory was won, but, in the end, his eyes became clear, bright, and steady.

"Well!" he exclaimed. "How did *you* get back?"

"I am asking you," I replied. "The queen was killed, and I thought I was dying, but I didn't. I came to out on the grounds a few minutes ago."

Newton grabbed his notebook in feverish haste and studied it intently. Dr. Ray looked worried, but did not interfere. While Newton was studying, Dr. Ray asked me, "What queen? What is he talking about?" but I paid him no heed. I was too much interested in my friend.

Ware put the notebook away with a very sad expression.

"I remember now what happened. The experiment was successful. But my formulas, unfortunately, did not tell me what would happen upon mixing small per cents of different intelligences. I transferred you about 98%, leaving 2% to insure the life of your body, while I transferred the queen only 5%, leaving 95% for you to ride in on top of and make use of. How did you get along?"

"Splendidly. I understand a lot of things now. The 95% was a

great help. But how did I get along?"

"You got along horribly," he answered. "You went wild. I tried to control you and preserve the equipment, but I failed. The last thing that I can remember is that I fell violently as the result of a tremendous push. You had the strength of a mad man."

"Dr. Ray says the equipment was badly disrupted. That being the case, can you explain how I got back?" I asked.

"I can remember that much. Your intelligence was not firmly bound into her body in the same sense that it would have been had you been born in it. When the body died, you were released. Since your own body still lived, your mind probably made the return trip with the speed of light."

Newton's face fell as he continued.

"But that is the end of the experimentation. There will be no more transfers. The particular inspiration for the conception and interpretation of these formulas, you once told me I had, is gone, and I do not understand them. In some strange way, I seem to know that I shall never recover that inspiration."

"See if you can remember this one feature about it," I said, somewhat nervously. "Am I, now, carrying 5% queen in my brain?"

I THOUGHT surely that he was going to relapse, he looked so distressed, and I was sorry that I had said anything. The struggle within him must have lasted a minute.

"I am sure I do not know," he said. "You will have to determine that for yourself, if you can. Let's go home and forget it."

Not until then did we realize that we had an audience, so intent had we been on our discussion. Unfortunately for us, Dr. Ray had heard every word and understood very little. He insisted upon an explanation, and we refused to give it. He kept us three days before he would release us with a clean bill of health, and he only released us then, after I had given him my reluctant promise to send him a written account of the whole story.

My reunion with my family was joyous in the extreme. They had practically given me up as a hopeless case, even though they knew they had placed me in the care of the most competent physician in the country for what they thought was a mental disorder.

I found that my colony of bees had become so ferocious that my father had moved them to the farthest corner of the farm a mile from the house. I visited them, wearing a veil, as soon as I could with decency excuse my-

self from my rejoicing family.

I sat down by the side of the hive wherein I had my abode. Bees flew about me in clouds, and I was forced to keep my hands in my pockets. In a measure, I was sad. Sixth sense was gone, and I could not communicate with them. Perhaps, I reflected, if I thought hard enough they might sense it.

"Owos," I thought, with the very utmost concentration, "please do not do it. I, Masoul, wish you not to. Do not sting me, for I am Masoul returned to humanity. I will take care of you and see that you enter the winter with bounteous stores. I will not use smoke when I visit you. You may even rear a new Masoul in your own city, and we shall work together in harmony. Do you hear me, Owos?"

The reward for my effort was several sharp stings. Several of the bees had penetrated my clothing, and, with barbless stingers,

were dealing me misery. I was forced to slap at them until I had killed them. I left the swarm then, knowing that I could never again communicate with them, and that, as a human, my work was cut out for me. The colony died that day as the result of poisoning with carbon bisulphide gas. I burned all that remained when the asphyxiation was complete.

THIS is my story as written for Dr. Ray. Since he is to read it, I may as well give it to the world. While you are reading it, I shall be getting together my beekeeping equipment.

They tell me that times are getting better and that I could probably find employment if I tried. In fact, Newton Ware has found a very good position for himself. As for myself—well, I am just not interested. I am a beekeeper for life.

THE END

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THE SPECTROSCOPE

by S. E. COTTS

Daybreak—2250 A.D. By Andre Norton. 182 pp. Ace Books. Paper: 35¢.

This is a reprint, but I'll report on it here as I missed it before, and I will always take the time to read an Andre Norton novel. After indulging myself I can happily announce that my time wasn't wasted. It is definitely one of her best. If I have any gripe, it is not with the writing, but with the fact that the book was retitled. It was originally published as *Star Man's Son*. This practice of changing names can have no other purpose than to gull the unwary into purchasing an old product in a new box. It is an old trick, but one which I had usually associated more with Grade C movies than with Grade A books. A superior product needs no excuses in order to make a reappearance.

Gripes aside, this is a wonderful story. Set some 200 years after the near-destruction of the world in a nuclear holocaust, it

deals less with the reasons for the tragedy and more with the way life and customs have been carried on. We are introduced to three main groupings; the farmers, the herders, and the seekers after knowledge. The hero belongs to the last category, though he has been denied full membership because he is a mutant. The story deals with his attempts to win recognition for himself as a gatherer of knowledge and worthy successor to his father.

One hint to the author might be in order, however. Miss Norton need make no apologies for the fact that she is a woman. She writes in an almost aggressively masculine manner. No one would ever accuse her of frailty or weakness. The deeds she describes are robust, with many of the qualities of the old epic poems. But her complete exclusion of any romantic tinges, or indeed, of any characters who happen to be female by accident of birth, is as unrealistic as the

work of those authors who do nothing but write "girlie" tales with a little science thrown in. Take one man's word for it, Miss Norton—the last way to emulate masculine writing is to be anti-feminine. So relax and give us everything in moderation. We've accepted you in the ranks of us "mighty men," and there's nothing more to prove.

The Unsleep. By Diana and Meir Gillon. 207 pp. Ballantine Books. Paper: 50¢.

Dare I suggest that something is happening to the British? It's too early to say yet whether the changes I've observed are due to a kind of "silly season" that will burn itself out before long, or whether they are symptomatic of a change of life. A short time ago, this column devoted some space to *The Primal Urge* by Brian Aldiss, a book which I took, at the time, to be nothing more than an author's letting off of steam for purposes of entertainment. It dealt with the government-sponsored drive to get all Englishmen equipped with an Emotional Register so that people could no longer hide their feelings for anyone else in the darkest recesses of their souls. Now along comes another book (also from Ballantine—maybe it's a publisher's plot!) with English authors and with equally earth-shaking news for

all Englishmen. Government clinics are now dispensing Sta-Wake to all who want it. "Don't waste your life," booms the TV. "Sta-Wake will banish forever the need to replenish your energies with time-consuming sleep." The problems England has faced in her long history seem infinitesimal compared to the ones these two books foist upon her.

Though Sta-Wake seems just the thing for the drudging English millions, it brings a whole host of problems. Once taken, there is no known antidote. And what to do with all that leisure time once it's obtained? And what about the bed manufacturers? And what will happen to the stalwarts who hold out against it?

One such stalwart, named Peter Gregory, is the hero of the book. But before long, he finds that his decision has brought him much more than he bargained for. His wife is, at first, submissive (which her PQ chart said was her type), but then she rebels and gets her shot, completing his sense of isolation from his fellows. She joins the wild merry-go-round of activity in order to fill her time—first with parties, then sex, gambling, and finally education and culture.

As far as the handling of all this in the Gillons' book, they manage to keep their unruly sub-

ject very well under control. However, in their effort to have a real story with a certain amount of conflict and not just a single-edged satire, they introduce several other threads. Abstractly speaking, this is a good thing, but in the present instance it has not been done too successfully. The various parts block each other's progress, and I think the book would have benefited from either the elimination or reduction of the parts where Peter Gregory takes to writing fiction. For the most part, though, it's an enjoyable book and a well-written one by two welcome new voices in the science fiction field.

Here England has been dutifully concerning herself these days with the soundness of the pound and the question of stability within the Commonwealth versus stability within the Common Market, and all this time, an insidious danger has been lurking right under her nose—not Young Men who are Angry (they have already gotten their share of the home front publicity), but the Young Men who are Irreverent. How many people do I know who have stood up staunchly in the face of crisis, but who melt at the first flick of ridicule! We extend the welcome mat to all such Irreverents, particularly if they're from someone else's country.

The Voices of Time. By J. G. Ballard. 158 pp. Berkley Medalion Books. Paper: 50¢.

Another (and a very different) look at what might happen when the need for sleep has been abolished, is furnished by one of J. G. Ballard's short stories. Called "Manhole 69," it traces a few nights in the lives of three men who have been relieved of the need for sleep by a delicate brain operation.

My first acquaintance with the work of Mr. Ballard was in a Judy Merrill anthology which contained a story titled "The Sound Sweep." This followed the strange, sad relationship between a mute and a retired opera singer. It is also included in the current anthology, and my opinion remains the same—that here is a highly original story from a talented new writer (in its poignance, not unlike the story of the deaf mute and his strange dependents in Carson McCullers' *The Heart is a Lonely Hunter*). It is very revealing, however, to see this story among Mr. Ballard's other ones here. For it turns out that "The Sound Sweep" is not at all typical of his output on two grounds: tone and quality.

As far as the difference in tone goes, my remarks are not to be taken as a form of criticism, merely as comparison. Though "The Sound Sweep" is not a hap-

py story, it is positively gay when taken next to the others. For they are almost completely dark and grim, or at the least, filled with tension. For instance, a man slowly goes insane, three men cannot sleep any more, a man produces duplicates of himself with tragic results, etc.

As far as quality goes, only one other of the seven included can match "The Sound Sweep" in its perfect blend of ideas and realization of them. It is called "Deep End" and it concerns a man's decision to stay on Earth even though it has become a dying planet. The other stories, though they show clearly the author's obvious gift for writing, have too great a disparity between the size of their conceptions and the extent of their fulfillments. (Not to mention the difficulties even the most experienced writers face when trying to fit large ideas into the short story form!) It takes much more than grandiose prose about "drifting epochs," "aisles of light" and "chasmic eddies" to make a vision. First must come a clear philosophical concept; then, if the Muse is on one's side, the words will grow organically from this concept. I'm not too worried, however. I suspect that time and the maturing process will solve this problem for Mr. Ballard. For, as I said earlier, he did solve it in one story, "Deep

End," and this is not the kind of problem that gets solved by accident—even once.

Planet of the Damned. By Harry Harrison. 135 pp. Bantam Books. Paper: 40¢.

This is Mr. Harrison's third book of which I am aware. One I just reviewed last month, but *Planet of the Damned* bears little relation to it. It is much more like his first novel, *Deathworld*. Both of these novels treated of planets whose environments were so hostile as to make human life as we know it unsupportable. Given a situation like this, many writers would invent a scientifically-minded people who lived in airdomes or underground, etc. But not Harry Harrison. His people are rugged, and with no proper equipment and the most primitive of tools, they set out to adapt themselves to the worst their land has to offer. They never attempt to modify the exterior; they themselves must change—or else.

This is fine as long as the author sticks to a straight narrative. But when the time comes for an explanation of how these adaptations are made, whether it be biologically or ecologically, the author seems on weaker ground. It is unfortunate that Mr. Harrison's solutions are not as original as the problems he sets up.

Dear Cele:

I have read with great pleasure and with a whole series of modest blushes the S. F. Profile of myself written by the amiable and flattering pen of Sam Moskowitz.

However, an error slipped into the piece which involves someone other than myself, and does him a grave injustice. I feel that I must correct this and I would appreciate it, therefore, if you would print this letter in your reader's column.

Mr. Moskowitz tells the story of how I provided an item for Donald A. Wollheim free of charge and was then threatened by John W. Campbell, Jr., editor of ASTOUNDING SCIENCE FICTION with a blackballing unless I obtained payment.

This incident (which took place in late 1940) is a bit more complicated than it appears to be in the Profile. However the point is that the editor who did the threatening was *not* Mr. Campbell. It was another man, now dead, whose name is not important.

Let me state as flatly as I can that Mr. John W. Campbell, Jr. has *never, never, never* threatened to reject my stories for any reason whatever, except for that of being unworthy of publication. I have known him very well



over a period of nearly a quarter of a century, and I wish to state that using his editorial position as a club is foreign to his nature. Furthermore, as far as I personally am concerned, in all the years we have worked together, John Campbell has been kindness itself to me at all times, and if I owe my career to anyone, it is to him.

Isaac Asimov

• *Our apologies for an unintended error to Messrs. Asimov and Campbell.*

Dear Editor:

Exactly what was Mr. David Hadaway trying to prove in his March letter?

He stated that *sf* is essentially

the same now as it was 20 years ago—he described it as being all “blood and thunder.” To illustrate his debatable point he pointed out that both featured stories in the November AMAZING were exactly that—“blood and thunder” action/adventure yarns.

How low can a person get! I’m afraid that David Hadaway drew his conclusions just a little too quickly for them to be at all convincing. I’m sure that you at AMAZING didn’t make any attempt to transform Mr. Maine’s novel into any kind of a “literary” effort. It was as you described it: “A taut drama of scientific intrigue.”

Even if that one issue did fit in with his preconception of sf, has he not heard of collecting information from more than one or two sources before drawing a conclusion? It seems as if he deliberately chose fact to fit his theory instead of theory to fit fact.

Using the “Hadaway yardstick” then as a tool to measure sf, we can draw this conclusion(s): “Pawn of the Black Fleet” = sf = poor characterization and “blood and thunder” action/adventure. Mr. Hadaway will have to do some fast talking to convince me of the validity of that equation—one drawn directly from his own fallacious inferences!

General comments: please, more Schmitz! I’m not at all fussy. I like him in any shape or form and Wellan Dasinger isn’t a bad fit. I would also like to commend artist Lloyd Birmingham on his March cover. I wonder what he’d look like on the inside? (Ed.: you’ll see in July.)

I’m afraid that Anderson’s February story wasn’t up to his usual level, but it did have some interesting things to say about men—and politicians.

“Mindfield” was light-years beyond Herbert’s October contribution, both in scope and execution. I really enjoyed that one all the way.

Ken Winkes
Arlington, Wash.

● *Couldn't agree more. Besides, we'd rather "sink" to blood-and-thunder, if necessary, than to thud-and-blunder. FYI, more Schmitz stories scheduled in future issues.*

Dear Editor:

The guest editorial by Bob Bloch came as a surprise to me. For the past year or so I have been writing and asking why he has been absent from your pages for so long—and either the letter wasn’t printed or that part was cut out, as it probably will be from this letter, if it is printed. As I have many times said, Bob Bloch is a great writer in sf as

well as in horrors, and I'm still hoping to see a story from him in either your pages or in FANTASTIC'S.

The rest of the stories in your March issue were all good, but the best was "Mindfield!" by Frank Herbert. The thing I like about his stories, besides the fact that they are well-written, is that his ideas are original. But then, all the stories in that issue seemed to have a new concept to add to the field.

Bob Adolfsen
9 Prospect Ave.
Sea Cliff, N.Y.

● *Bloch is in great demand in Hollywood as a top-price script writer—which is why he would like to—but can't—write more for us.*

Dear Editor:

PLEASE!! It's bad enough that one magazine publishes Ferdinand Feghoot! Please tell me that Benedict Breadfruit was just a filler for the March issue only! The space wasted by it could be put to better use, I'm sure. For instance, an An Lab similar to the one published by ASF. I am a fairly new convert to sf, and I would like to see a small Fanzine review, reviewing one fanzine a month. You could put it at the end of *The Spectroscope*.

On the whole, I like shorter

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stories better than longer ones, but if you keep on publishing serials on par with the ones you have been publishing lately, like "Second Ending," "Pawn of the Black Feet," and "The Man Who Had No Brains," I am all for serials. Keep 'em comin'!

As to the rest of the contents of the March ish, I could not wade thru the first five pages of "Mindfield!," but the rest of the stories were extremely well written.

I agree whole-heartedly with Bob Bloch's editorial. There is much top-grade science fiction available today, which would not be too hard on the producer's budget, such as Murray Leinster's "Med" series.

Gary Pokrassa,
Franklin Square
New York

● *Sorry. Love us, love our Breadfruit. That's the way it goes around here.*

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